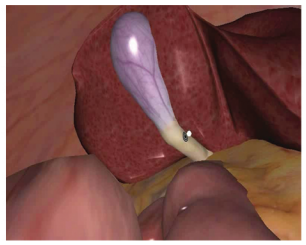

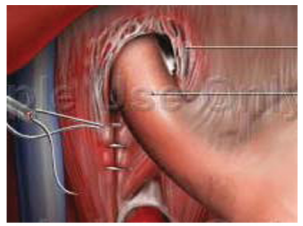

Generally, over the last few decades, it gained international acceptance, and became a point of interest for surgeons and gynecologists.

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The result was this colored atlas of laparoscopy, I hope that it will be beneficial for our students and colleagues

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COLOR ATLAS OF LAPAROSCOPY

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Preface

The sphere of surgery is ever changing , one of the major changes at the end of thetIntieth century was minimally invasive surgery, especially endocopic surgery, including laparoscopy .

Now endocopic procedures enter most fields of surgery, both in urgent and elective conditions. Generally, over the last few decades, it gained international acceptance, and became a point of interest for surgeons and gynecologists .It helped in improving patient care, with shorter stay in hospital, shorter period of absence from family and work.

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CONTENTS

1. History & Development	1
2. Laparoscopic Equipments & Instruments	31
3. Anesthesia	141
4. Laparoscopy in general	161
5. Diagnostic Laparoscopy	183
6. Laparoscopic procedures	213
7. Complications	343
Index	373

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They are Dr. G.F. Begin (Chirurgie generale et eshetique Dijon / France)and Dr. David Nocca (CHU) de Montepellier St. Eloi /
me the basic techniques of minimally invasive surgery specially laparoscopy for obesity, at European Surgical Institute in 2006.
I would like to thank Stortz Company for kindly allowing me to use the pictures of their products for illustration in this Atlas.
I would have never been able to publish this atlas without help and funding of university of Sulemani - Committee of Edition ad Translation.
I appreciate the help of our anesthetic colleague Dr.Aamir Murad Xudadad, who contributed the chapter on preoperative preparation and anesthesia

INTRODUCTION

Early in 2002 I started Laparoscopic surgery in Sulemani city in Sulemani Teaching Hospital, next year gynecologists started laparoscopic surgery in Sulemni Maternity hospital.It is worthy to mention that Dr Dler Nuri Rashid was practicing diagnostic gynecological laparoscopy using old system without aVideo or an automatic insufflators, many years before above mentioned date.

The first Private Laparoscopic Hospital in Sulemani was Hatwan Private Hospital opened on 14th July 2004.

Presence of laparoscopic facilities, in these hospitals, increasing awareness of patients of their wellbeing and good results of laparoscopic surgery changes the attitude of both surgeons and patients from open to laparoscopic surgery: specially for cholecystectomy, appendectomy, liver and pancreatic biopsy, explorative laparoscopy for undiagnosed abdominal pain , ovarian pathology and investigation for infertility.

All the knowledge of laparoscopy could not be gained from one text book that adds to the difficulties for beginners in the field, especially in the imagination of the procedure; therefore, we felt that a colored atlas of laparoscopy may help in better imagination and perception of the procedures.

This book is the result; I hope that it will be of value to students and to our colleagues learning laparoscopy.

Assistant Professor Dr. Hiwa Omer Ahmed

HISTORY

HISTORY

Surgery is the first and the highest division of the healing art, pure in itself, perpetual in its applicability, a working product of heaven and sure of fame on earth" - Sushruta (400 B.C.)

Access to body cavities in order to undertake surgical procedures by other means than making a large incisions has been a technique waiting for its time. Laparoscopy is the technique of the new millennium

for doing most of abdominal operations. This is a form of Minimally Invasive Surgery and it is one of the most significant advancement of Surgery which took place in the 20th century. Currently, Minimal Access Surgery is the broad umbrella under which all endoscopic surgeries are placed.

Laparoscopic surgical techniques are being applied to a growing number of surgical procedures. Patients are attracted to the reduced pain and faster recovery associated with the procedures, and surgeons are finding that laparoscopic surgery matches traditional open procedures in terms of effectiveness

Translated from the Greek, "Laparoscopy" means examination of the abdomen with a scope, which is also known as an Endoscope. An Endoscope in the bladder is cystoscopy and in the uterus is hysteroscopy and so on. The other terms loosely used are key-hole surgery and laser surgery.

Explaining laparoscopic surgery is best accomplished by comparing it to traditional surgery. With traditional or 'open' surgery, the surgeon must make an incision that exposes the area of the body to be operated on. Until a few years ago, opening up the body was the only way a surgeon could perform the procedure. Now, laparoscopy eliminates the need for a large incision. Instead, the surgeon uses a

. Bozzini used an aluminium tube to visualize the genitourinary tract. The tube, illuminated by a wax candle, had fitted mirrors to reflect images.

1853, Antoine Jean Desormeaux, a French surgeon first introduced the 'Lichtleiter" of Bozzini to a patient. For many surgeons he is considered as the "Father of Endoscopy".

1867, Desormeaux, used an open tube to examine the genitourinary tract, combining alcohol and turpentine with a flame in order to generate a brighter, more condensable beam of light.

laparoscope, a thin telescope-like instrument that provides interior views of the body.The earliest recorded references to endoscopy date to ancient times with Hippocrates.

In his description there is explanation of rectum examination with a speculum. Moreover, Hippocrates treated these life-threatening conditions with minimally invasive approaches.

1585, Aranzi was the first to use a light source for an endoscopic procedure, focusing sunlight through a flask of water and projecting the light into the nasal cavity

1706, The term “trocar,” was coined in 1706, and is thought to be derived from trochartor troise-quarts, a three-faced instrument consisting of a perforator enclosed in a metal cannula.

1806, Philip Bozzini, built an instrument that could be introduced in the human body to visualize the internal organs. He called this instrument "LICHTLEITER"

1868, Kussmaul performed the first esophagogastroscopy on a professional sword swalloIr, initiating efforts at instrumentation of the gastrointestinal tract. Mikulicz and Schindler, hoIver, are credited with the advancement of gastroscopy

1869, Commander Pantaleoni used a modified cystoscope to cauterize a hemorrhagic uterine growth. Pantaleoni thus performed the first diagnostic and therapeutic hysteroscopy

1901, Dimitri Ott, a Petrograd gynecologist wore head mirrors to reflect light and augment visualization and used access technique in which a speculum was

introduced through an incision in the prior fornix in a pregnant woman.

1901, The first experimental laparoscopy was performed in Berlin in 1901

by German surgeon Georg Kelling, who used a cystoscope to peer into the abdomen of a dog after first insufflating it with air. Kelling also used filtered atmospheric air to create a pneumoperitoneum, with the goal of stopping intra-abdominal bleeding (Ectopic pregnancy, bleeding ulcers, and pancreatitis) but these studies did not find any response or

supporters. Kelling proposed a high-pressure insufflation of the abdominal cavity, a technique he called the "Luft-tamponade" or "air-tamponade".

1910, H.C. Jacobaeus of Stockholm published a discussion of the inspection of the peritoneal, pleural and pericardial cavity.

1911, Bertram M. Bernheim, from Johns Hopkins Hospital introduced first laparoscopic surgery to the United States. He named the procedure of minimal access surgery as "organoscopy". The instrument used

was a proctoscope of a half inch diameter and ordinary light for illumination was used.

1911, H.C. Jacobaeus, again coined the term "laparothorakoskopie" after using this procedure on the thorax and abdomen. He used to introduce the trocar inside the body cavity directly without employing a pneumoperitoneum.

1918, O. Goetze, developed an automatic pneumoperitoneum needle characterized for its safe

1934, John C. Ruddock, an American surgeon described laparoscopy as a good diagnostic method, many times, superior than laparotomy. John C. Ruddock used the instrument for diagnostic laparoscopy which consisted a built-in forceps with electro coagulation capacity.

introduction to the peritoneal cavity.

The next decade and a half saw an interruption of technological advances and a lack of any substantial development in endoscopy due to World War I.

1920, Zollikofer of Switzerland discovered the benefit of CO2 gas to use for insufflation, rather than filtered atmospheric air or nitrogen.

1929, Heinz Kalk, a German gastroenterologist developed a 135 degree lens system and a dual trocar.

approach. He used laparoscopy as a diagnostic method for liver and gallbladder disease.

Chapter I History of Laparoscopy

1936, Boesch of Switzerland is credited for doing the first laparoscopic tubal sterilization

1938, Janos Veress of Hungary developed a specially designed spring-loaded needle. Interestingly, Veress did not promote the use of his Veress needle for laparoscopy purposes. He used veress needle for the induction of pneumothorax. Veress needle is the most important instrument today to create pneumo-peritoneum. Veress needle consists of an outer cannula with a beveled needle point for cutting through tissues. Inside the cannula of verses needle is an inner stylet, stylet is loaded with a spring that spring forward in response to the sudden decrease in

Chapter I History of Laparoscopy

pressure encountered upon crossing the abdominal wall and entering the peritoneal cavity.

1939, Richard W. Telinde, tried to perform an endoscopic procedure by a culdoscopic approach, in the lithotomy position. This method was rapidly abandoned because of the presence of small intestine.

1939, Heinz Kalk published his experience of 2000 liver biopsies performed using local anaesthesia without mortality.

1960, Kurt Semm, a German gynaecologist, who invented the automatic insufflator. His experience with this new device was published in 1966. Although not recognized in his own land, on the other side of the Atlantic, both American physicians and instrument makers valued the Semm's insufflator for its simple application, clinical value, and safety.

1960, British Gynaecologist Patrick Steptoe adapted the techniques of sterilization by two puncture technique.

1966, Kurt Semm introduced an automatic insufflation device capable of monitoring intra-abdominal pressures. This reduced the dangers

1944, Raoul Palmer, of Paris performed gynaecological examinations using laparoscopy and placing the patients in the Trendelenberg position, so air could fill the pelvis. He also stressed the importance of continuous intra-abdominal pressure monitoring during a laparoscopic procedure.

1953, The rigid rod lens system was discovered by Professor Hopkins. The credit of videoscopic surgery goes to this surgeon who has revolutionized the concept by making this instrument.

1973, Gaylord D. Alexander developed techniques of safe local and general anaesthesia sitable for laparoscopy.

1977, First Laparoscopic assisted appendicectomy was performed by Dekok. Appendix was exteriorized and ligated outside.

1977, Kurt Semm first time demonstrated endoloop suturing technique in laparoscopic surgery.

associated with insufflation of the abdomen and alloId safer laparoscopy.

1970, Gynaecologists had embraced laparoscopy and thoroughly incorporated the technique into their practice. General surgeons, despite their exposure to laparoscopy remained confined to traditional open surgery.

1972, H.Coutnay Clarke first time shoId laparoscopic suturing technique for hemostasis.

Chapter I History of Laparoscopy

1978, Hasson introduced an alternative method of trocar placement. He proposed a blunt mini-laparotomy which permits direct visualization of trocar entrance into the peritoneal cavity. A reusable device of similar design to a standard cannula but attached to an olive-shaped sleeve was developed by Hasson. This sleeve would slide up and down the shaft of the cannula and would form an airtight seal at the fascial opening. In addition, the sharp trocar was replaced by a blunt obturator. This cannula is held in place by the use of stay sutures passed through the fascial edges and attached to the body of the cannula.

1980, In United Kingdom Patrick Steptoe, started to perform laparoscopic procedures.

Chapter I History of Laparoscopy

1983, Semm, a German gynaecologist, performed the first laparoscopic appendicectomy.

1985, The first documented laparoscopic cholecystectomy was performed by Erich Mühe in Germany in 1985.

1987, Ger reported first laparoscopic repair of inguinal hernia using prototype stapeler.

1987, Phillipe Mouret, has got the credit to perform the first laparoscopic cholecystectomy in Lyons, France using video technique. Cholecystectomy is the laparoscopic procedure which revolutionized the general surgery.

1988, Harry Reich performed laparoscopic lymphadenectomy for treatment of ovarian cancer.

under supervision before being alloId to do this procedure on their own.

1990, Bailey and Zucker in USA popularized laparoscopic anterior highly selective vagotomy combined with posterior truncal vagotomy.

1989, Harry Reich described first laparoscopic hysterectomy using bipolar dessication; later he demonstrated staples and finally sutures for laparoscopic hysterectomy.

1989, Reddick and Olsen reported that CBD injury after laparoscopic cholecystectomy is 5 times that with conventional cholecystectomy. As a result of this report USA government announced that surgeons should do at least15 laparoscopic cholecystectomy

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1994, A robotic arm was designed to hold the telescope with the goal of improving safety and reducing the need of skilled camera operator.

1996, First live telecast of laparoscopic surgery performed remotely via the Internet.

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Color Atlas of Laparoscopy
Chapter II Equipments and Instruments

EQUIPMENTS AND INSTRUMENTS

Laparoscopic trolley

2.1: Equipments

In the Operative room (OR), we need the following equipments;

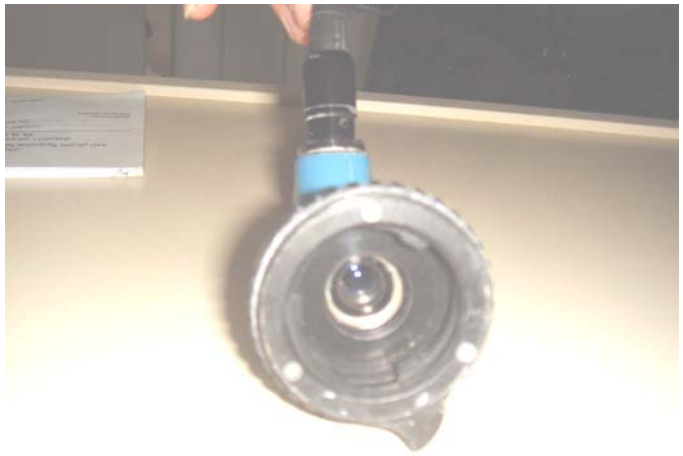
1. Ordinary operative room equipments; as any laparoscopic operations may be changes to open surgery. So we need every thing which is necessary for open surgery like, ceiling lights, sucker, cautery (coagulation) machine, …etc
2. laparoscopic equipments, in a trolley , composing of ;
   *Monitor and Video System
   *Camera receiver
   *Light Source
   * Coagulation, cutting machine.
   * CO_2 insufflators
   * Suction, Irrigation unit

2.1.1: Video system

2.1.1.1: Camera

Camera receives the images from the telescope and displays it via the video system on both monitors' .It attaches over the laparoscope eyepiece and in some cases it is an integral part of the scope. Cameras vary in

sensitivity and image identification according to the number of silicon chips; a single chip camera has a resolution of 450 lines per inch.



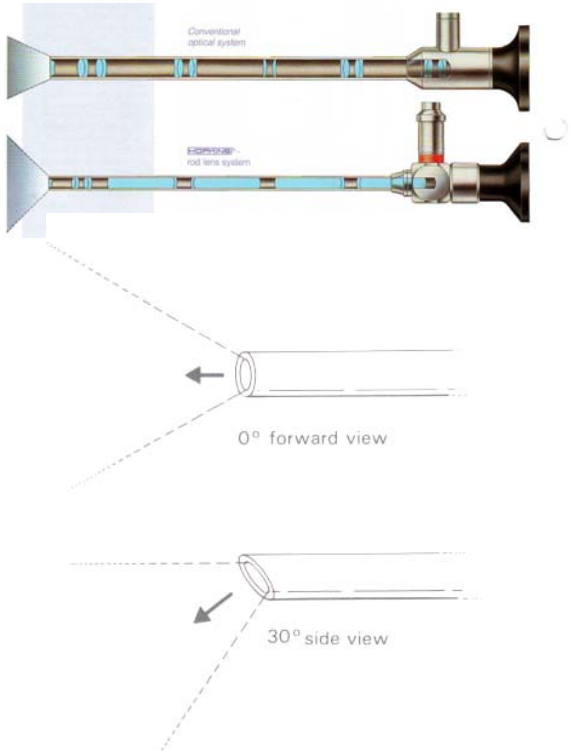
While a three chip resolves images to 700 lines per inch.

A sophisticated apparatus which changes two colored pictures to multicolored or colored near normal pictures, put in the trolley, o which the camera will be connected

2.1.2: Light source

A high intensity cold light source such as xenon or a halide is required to provide sufficient light, which gives near normal colors and abolishes the shadow of the instruments

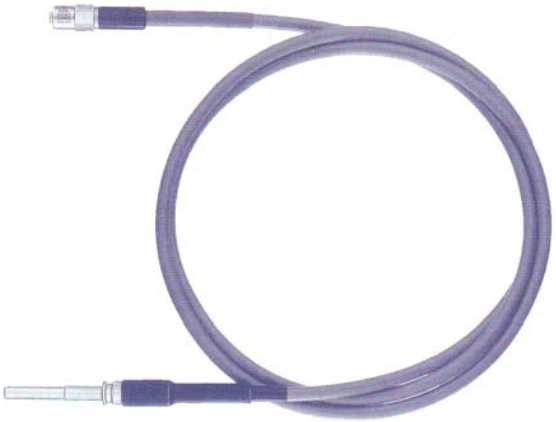
2.1.3: Light cable



2.1.4: Monitors

A light resolution monitor should be compatible with the camera, for single chip camera a standard 400 line per inch monitor is adequate. The larger the monitor, the clearer the image

A sheath containing hundreds of fiber optics to transmit the light from the light source to the telescope



2.1.3: Telescope

It is a slender multi rigid lens system, either 5 or 10mm in diameter and 35 cm in length with different angle. Usually we use either 0 or 30 angle scope.

We need two monitors first in front of the camera man and or assistant and second in

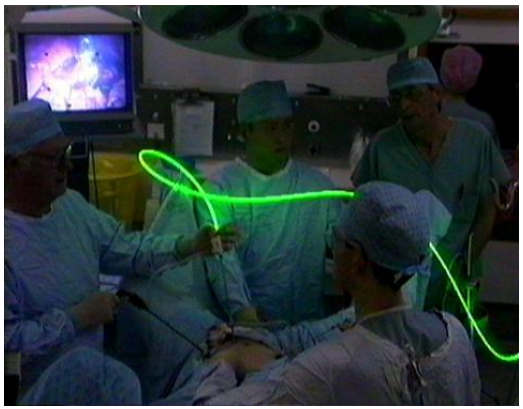
front of the surgeon, in order to save time and unnecessary effort, turning of the surgeon or the assistant.

2.1.5: Coagulating instruments

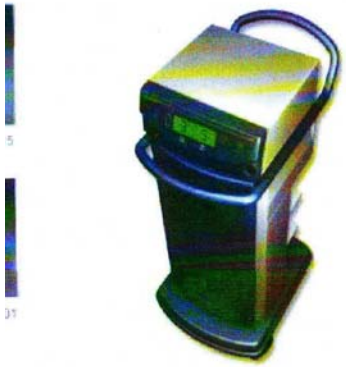
This party may be of many type, chronologically they are;

1. Electric coagulation, cutting machine

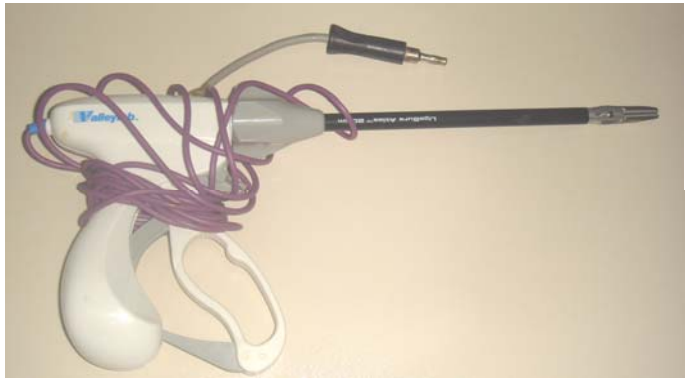
2. Laser coagulation, cutting machine



3. Ultrasonic coagulation, cutting machine called Harmonic



4. Ligasure coagulation, cutting machine which is just electric coagulation, cutting machine, with special range of strength and special hand instruments which is thermo- regulating negatively feed backing the machine to stop in certain temperature



supplies gas until the required intra-abdominal pressure is reached. The insufflator activates and delivers gas automatically when the intra-abdominal pressure falls because of gas escape or leakage from the ports. The required values for pressure and flow can be set exactly using jog keys and digital displays. Insufflation pressure can be continuously varied from 0 to 30 mm Hg; total gas flow volumes can be set to any value in the range 0-9.9
Patient safety is ensured by optical and acoustic alarms as well as several mutually independent safety circuits. The detail function and quadro-manometric indicators of insufflator is important to understand safety point of view. The important indicators of insufflators are preset pressure, actual pressure, flow rate and total gas used.

2.1.6: CO_2 insufflators

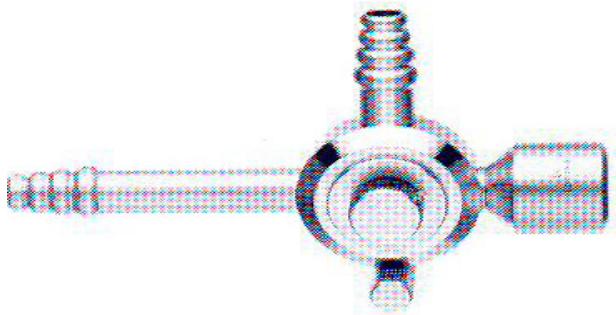
The Electronic CO2 Laproflattor is a general purpose insufflation unit for use in laparoscopic examinations and operations.

Controlled pressure insufflation of the peritoneal cavity is used to achieve the necessary work space for laparoscopic surgery by distending the antero-lateral abdominal wall and depressing the hollow organs and soft tissues. Carbon dioxide is the preferred gas because it does not support combustion, it is very soluble which reduces the risk of gas embolism, and is cheap.

Automatic insufflators allow the surgeon to preset the insufflating pressure, and the device

2.1.7: Suction, irrigation unit

This is a unite which enable the surgeon to use both irrigation and suction via same hand instrument



It is used for flushing the abdominal cavity and cleaning during endoscopic operations. It has been designed for use with the 26173 AR suction /instillation tube. Its electrically driven pressure/suction pump is protected against entry of bodily secretions. The suction irrigation machine is used frequently at the time of laparoscopy to make the field of vision clear. Most of the surgeons use normal saline or ringer lactate for irrigation purposes. Sometime heparinized saline is used to dissolve blood clot to facilitate proper suction in case of excessive intra-abdominal bleeding.

2.2: INSTRUMENTS

Several factors should be considered at the time of choosing laparoscopic instrument, including cost, availability and reliability. Reusable instruments are expensive initially but in long rum they are cost effective. The disposable instrument cost is less compared to re-usable but patient cost is increased. In many countries re-use of disposable instrument is seen.

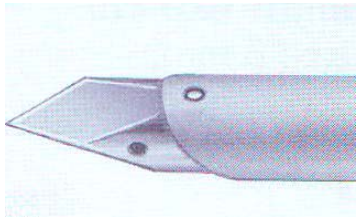
In developing countries, disposable nstruments are very rarely used because labour cost is low compare to the cost of disposable instrument. In Europe and USA, surgeons often choose to use disposable instrument in order to save high labour cost. The main advantage of disposable instrument is high performance due to its sharpness and reduced chance of disease transmission due to certified high-end factory sterilization. However, once discarded, environment concerns are raised about disposal and biodegrability of disposable instruments. Ideally disposable instrument should not be used repeatedly because handling, sorting, storing and sterilization make these instrument questionable. The disposable instruments are not sterilized properly by dipping in gluteraldehyde because they are not dismountable. Insulation of disposable instrument also can be torn easily which can lead to electrosurgical injuries.

2.2.1: Veress Needle

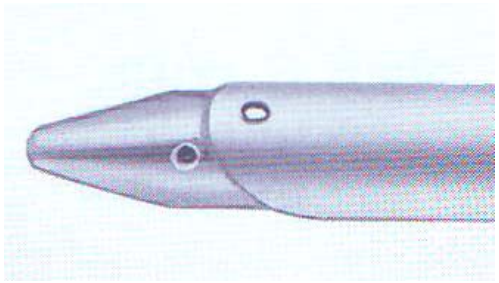
Veress needle was invented by a chest physician for aspiration of pleural effusion keeping in mind that its spring mechanism and blunt tip will prevent the injury of lung tissue. Veress needle consists of an outer cannula with a beveled needle point for cutting through tissues. Inside the cannula is an inner stylet, which is loaded with a spring that spring forward in response to the sudden decrease in pressure encountered upon crossing the abdominal wall and entering the peritoneal cavity. The lateral hole on this stylet enables CO_2 gas to be delivered intra-abdominally.

Veress needle is used for creating initial pneumoperitoneum so that the trocar can enter safely and the distance of abdominal wall from the abdominal viscera should increase. Veress needle technique is the most widely practiced way of access. Before using veress needle every time it should be checked for its potency and spring action. Veress needle is available in three length 80mm, 100mm, 120mm. In obese patient 120mm and in very thin patient with scaphoid abdomen 80mm veress needle

should be used. Veress needle should be held like a dart at the time of insertion..



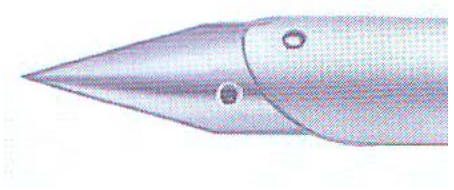
The tip can be penetrated through the parietal wall without cutting and decreased risk of herniation or haemorrhage is reported.



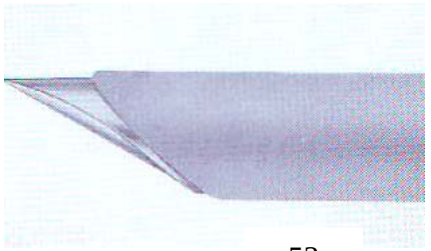
Cannulas are in general made from plastic or metal. Plastic devices whether they are transparent or opaque, need to be designed in such a way as to minimize the reflection of light from the telescope.

2.2.2: TROCAR and CANNULA

The word “trocar” is usually used to refer to the entire assembly but actual trocar is a stylet which is introduced through the cannula. The trocars are available with different type of tips. The cutting tips of these trocars are either in the shape of a three edged pyramid or a flat two edged blade.



Conical tipped trocars are supposed to be less traumatic to the tissue.



All the cannula has valve mechanism at the top. Valves of cannula provide internal air seals,

which allow instruments to move in and out within cannula without the loss of pneumoperitoneum. These valves can be oblique, transverse, or in piston configuration.

These valves can be manually or automatically retractable during instrument passage.

Reusable and disposable trocars are constructed by a combination of metal and plastic. The tip of disposable trocar has a two edged blade. These are very effective at penetrating the abdominal wall by cutting the tissue as they pass through.

Most of the disposable plastic trocar has a spring loaded mechanism that withdraws the sharp tip immediately after it passes through the abdominal wall to reduce the incidence of injury of viscera. Trocar and cannula are of different sizes and diameter depending upon the instrument for which it is used. The diameter of cannula ranges from 3 mm to 30 mm; the most common size is 5mm and 10 mm. The metal trocar has different type of tips i.e. pyramidal tip, Eccentric tip, conical tip or blunt tip depending on the surgeon’s experience.

Trumpet type valves are also present which provide excellent seals, but they are not as practical as some of the other systems. They require both hands during instrument insertion, which may explain why they are less often used in advanced laparoscopic cases.

The flexible valves limit the carbon dioxide leaks during work whatever the diameter of the instrument used.

Surgeon should remember that sharp trocars although looking dangerous are actually better than blunt one because they need less force to introduce inside the abdominal cavity and chances of inadvertent forceful entry of full length of trocar is less..

There is always a difference in the marked exterior diameter of the cannula and the interior usable diameter. The end of the cannula is either straight or oblique. An oblique tip is felt to facilitate the easy passage of the trocar through the abdominal wall.

Trocar and cannula should be held in proper way in hand so that head of the trocar should rest on the thenar eminence, the middle finger should rest over the gas inlet and index finger is pointed towards the sharp end of the trocar.

2.2.3: REDUCERS

Mot of the time the pot of the reusable clip applier ,which is 10mm ,used for introduction of other hand instruments like grasper, dissecting forceps ,suction irrigation tip or for coagulation hand piece which are 5mm in girth. To prevent loss of insufflated CO_2 from 10mm cannula , we will be obliged to use reducer to seal the defect and allow 5mm instrument we could call the reducer 10mm to 5 mm adapters . There are two types of reducers, the old one is as long as the cannula needs to be put and on change to 10mm instruments like clip appliers to be removed which takes up to one minute of the time at each insertion.

While the new type of reducer is a piece attached to the base of the cannula, needs seconds to be put and removed each time.

Color Atlas of Laparoscopy

Chapter II Equipments and Instruments

2.2.4; Laparoscopic Hand Instruments

Laparoscopic hand instruments vary in diameter from 1.8 to 12mm but majority of instruments are designed to pass through 5 to 10mm of cannula. The hand instrument used in laparoscopic surgery are of different length (varies company to company and length of laparoscopic instrument varies from 18 to 45cm) but they are ergonomically convenient to work if they have the same length of approximately 36 cm in adult and 28 cm in pediatric practice. Shorter instruments 18 to 25cm are adapted for cervical and pediatric surgery. Certain procedures for adult can also be performed with shorter instrument where the space is constricted. 45cm instruments are used in obese or very tall patients. For better ergonomics half of the instruments should be inside the abdomen and half outside. If half of the instrument is in and half out, it behaves like class 1 lever and it stabilizes the port nicely so the surgery will be convenient.
Most of the laparoscopic procedures require a mixture of sharp and blunt dissection techniques, often using the same instrument in a number of different ways. Many laparoscopic instruments are available in both re-usable and disposable version. Most re-usable instruments are partially dismountable so that it can

be cleaned and washes properly. Some manufacturer have produced modular system where part of the instrument can be changed to suit the surgeon favorite attachment like handle or working tip.

Most laparoscopic instruments like graspers and scissors has basic opening and closing function. Many instrument manufacturers during past few years are able to rotate at 360 degree angle which increases the degree of freedom of these instruments. Certain types of instrument offer angulations at their tip in addition to usual 4 degree of freedom. These instruments are used to avoid obstacles and for the lateral grasping when the instrument is placed outside of the visual field. This feature is available for both re-usable as well as disposable instrument. The complex mechanism of such instrument makes their sterilization very difficult.
A variety of instruments, especially retractors have been developed with multiple articulations along the shaft. When these are fixed with the tightened cable the instrument assumes a rigid shape which could not have been introduced through the cannula. Most of the hand instrument has three detachable parts.

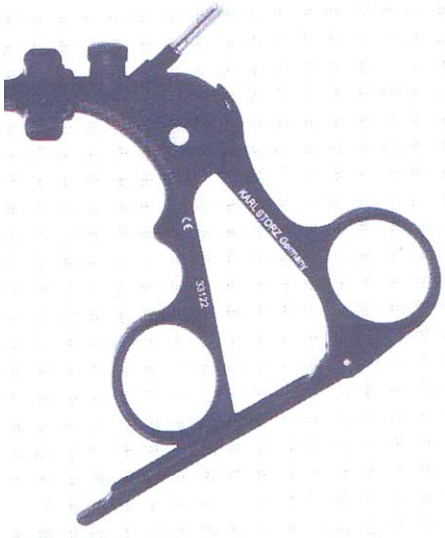
1. Handle,
2. Insulated outer tube and
3. Insert which makes the tip of the instrument.

Most of the Laparoscopic instruments handle has attachments for unipolar electrosurgical lead

and many have rotator mechanism to rotate the tip of the instrument.

Different Handles of Hand instrument

Certain instruments handle are designed to allow locking of the jaw.



This can be very useful when the tissue needs to be grasped firmly for long period of time preventing the surgeons hand from getting fatigue. The locking mechanism is usually incorporated into the handle so that surgeon can easily lock or release the jaws. These systems usually have a ratchet so that the jaws can be closed in different position and to different pressure.

Some multifunctional Laparoscopic handle has attachment for suction and irrigation and some time hand switch for cutting and coagulation switch of electrosurgery.

Cuschieri Ball Handle is invented by Prof. Sir Alfred Cuschieri. This handle lies comfortably in surgeon's palm.

This design reduces the fatigue of surgeon and eases rotation of the instrument by allowing rotation within the palm rather than using wrist rotation. Squeezing the front of the handle between the thumb and the first fingers increases the jaw

closing force; squeezing the rear of the handle between the thenar eminence of the thumb and last fingers opens the jaws.
Cuschieri pencil handle also has great ergonomic value specially when used with needle holder.

This handle allows the angle between the handle and the instrument to be altered to suit the surgeon's wrist angle. The conveniently placed lever of this pencil handle when pressed can change the angle. Just like ball handle, pressure at the front increases the jaw closing force while pressure at the rear opens the jaw.

Outer Sheath of Hand Instrument

The insulation covering of outer sheath of hand instrument should be of good quality in hand instrument to prevent accidental electric burn to bowel or other viscera.
Insulation covering may be of silicon or plastic,at the time of cleaning the hand instrument, utmost care should be taken so that insulation should not be scratched with any sharp contact. A pin hole breach in insulation is not easily seen by naked eye but may be dangerous at the time of electro surgery.

Insert of Hand Instrument

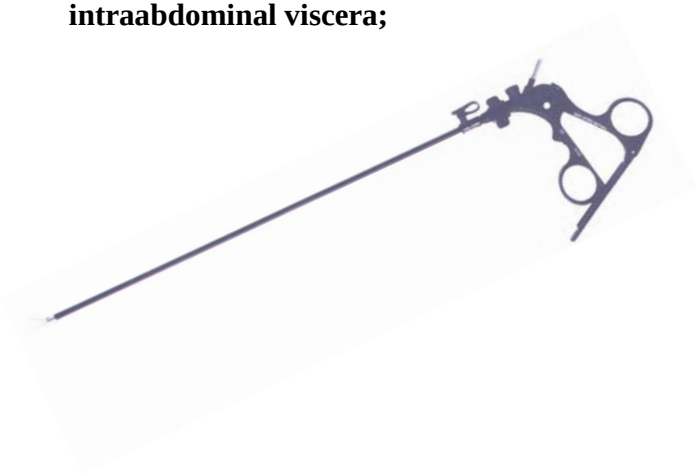
Insert of hand instrument varies only at tip. It may be grasper, scissors, or forceps. This grasper may have single action jaw or double action jaw. Single action jaw open less than double action jaw but close with greater force thus, most of the needle holders are single action jaw. The necessary wider opening in double action jaw is present in grasper and dissecting forceps. Single action graspers and dissectors are used where more force is required.

Most of the instruments are composed of

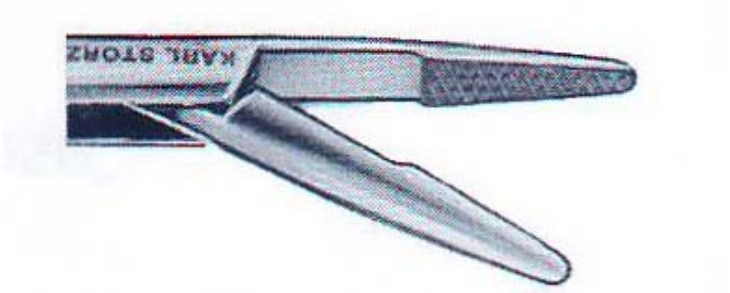
Handle
Insert or the shaft

2.2.4.1: GRASPING DISSECTING FORCEPS

Used to grasp, hold, retract and rotate the intraabdominal viscera;

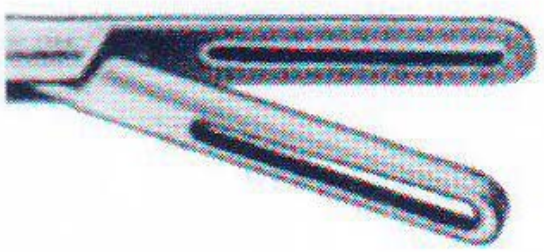


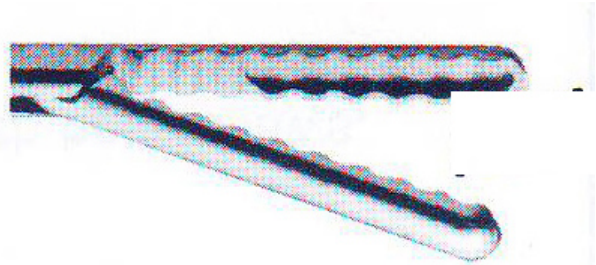
***single jaw**

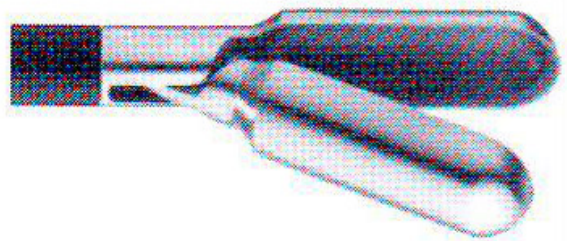


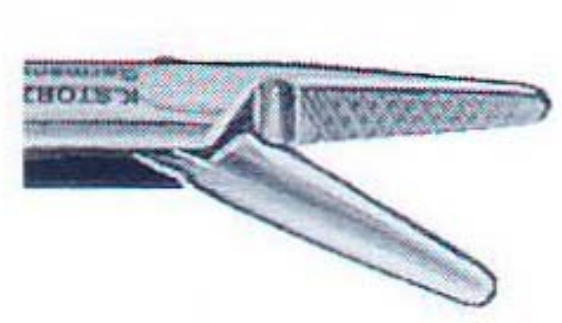
Tip

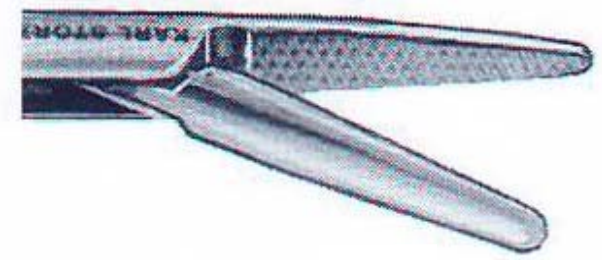
All are different in the tip, some in handle
So we try to show you the tip of the instrument in each group to make easy for recognition

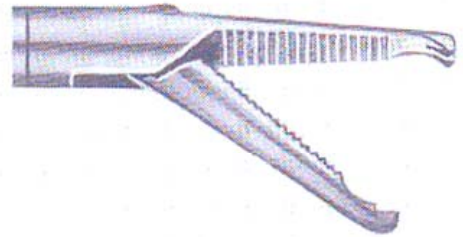


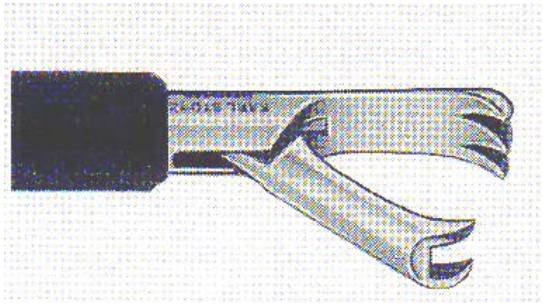


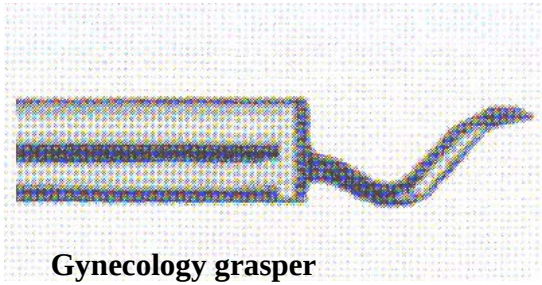






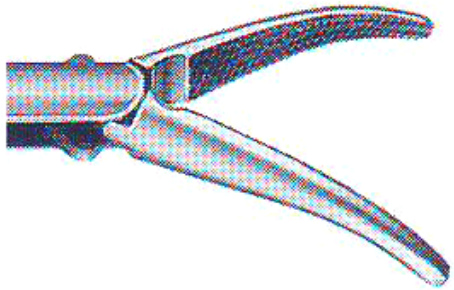


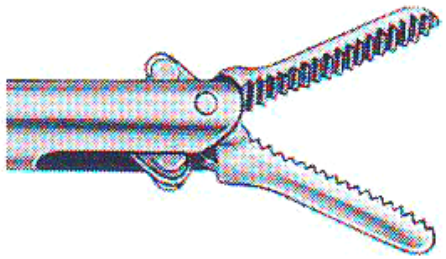


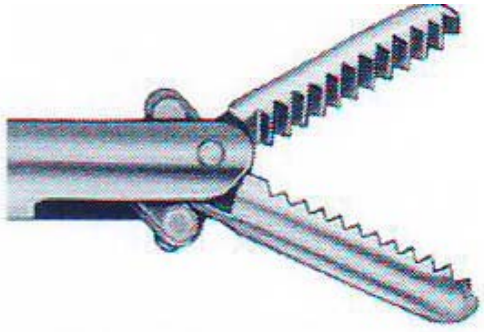


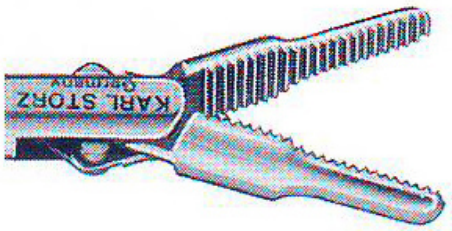
Gynecology grasper

Double jaw








KARL STORZ
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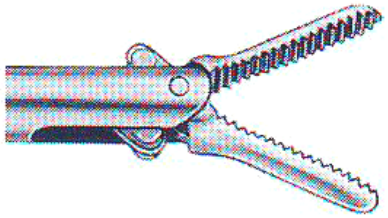
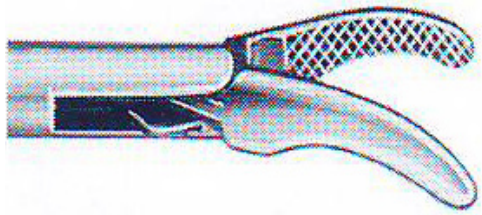
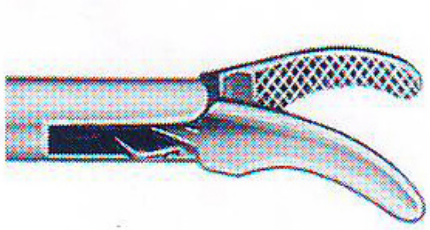
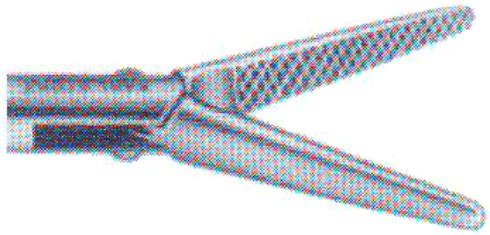
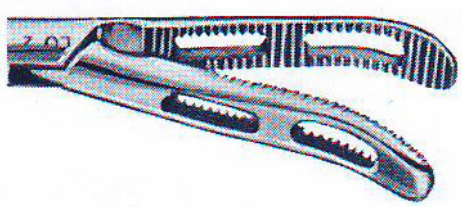
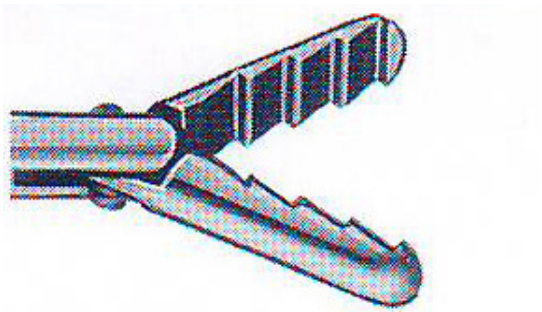


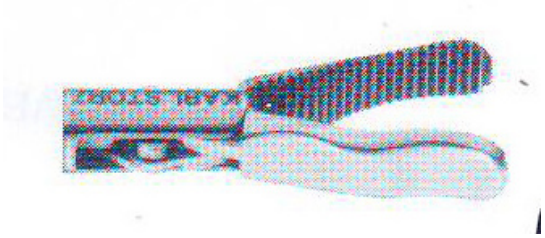


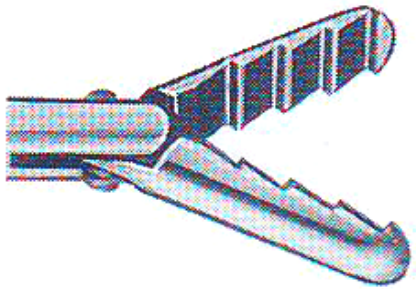


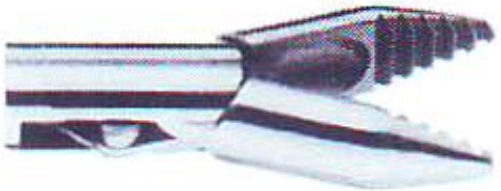


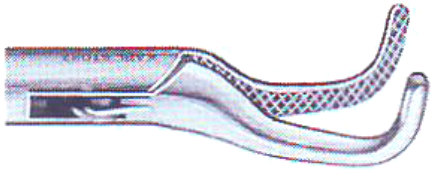


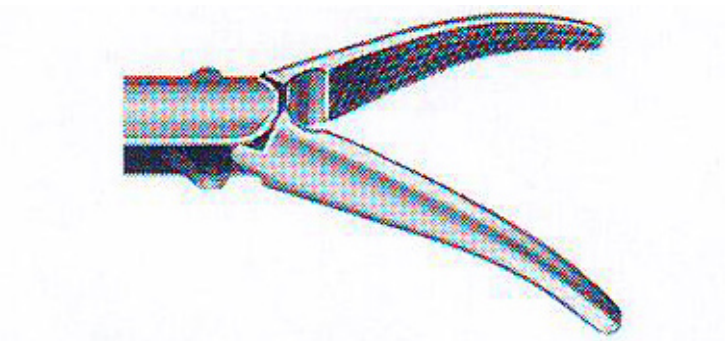


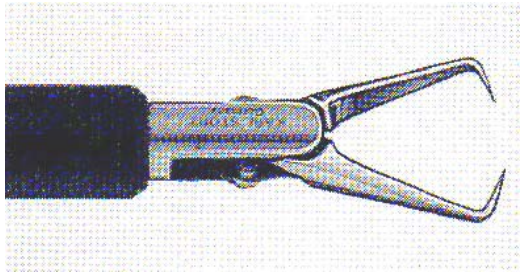


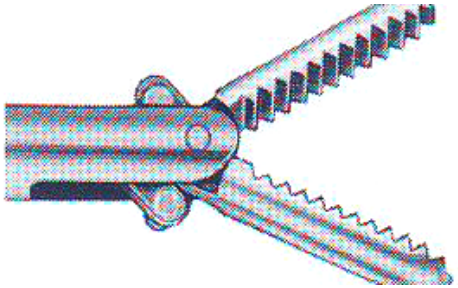


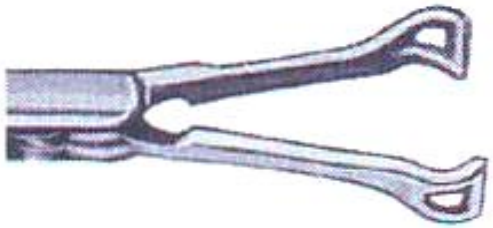


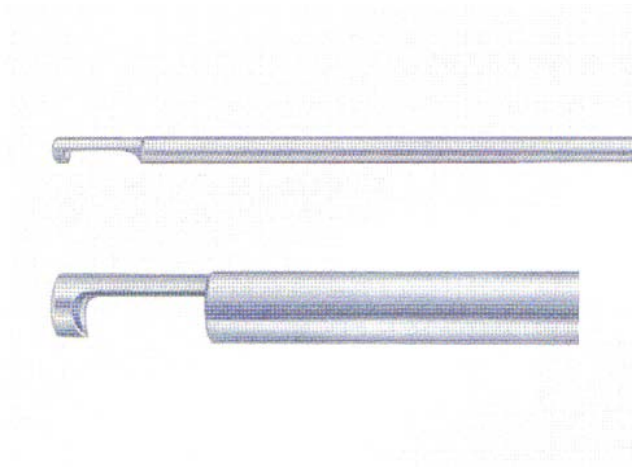






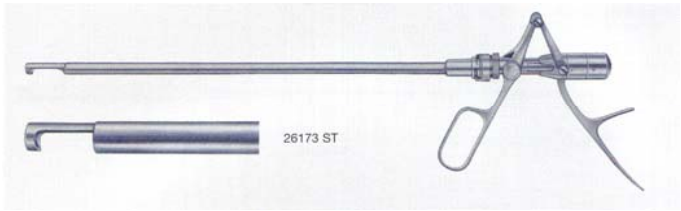




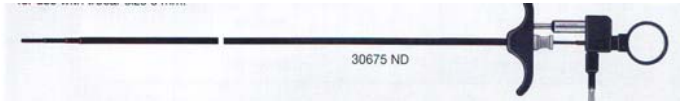


2.2.4.2; Dissecting Biopsy forceps

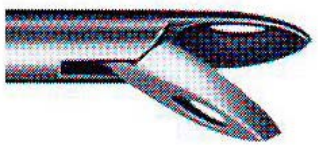
It also composed of three parts the handle either ordinary



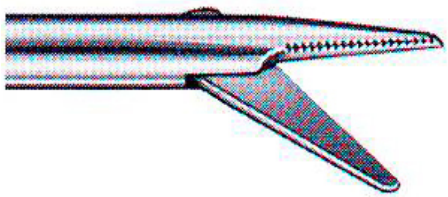
Spring-loaded handle



The shaft is same in all types, while the tips are different



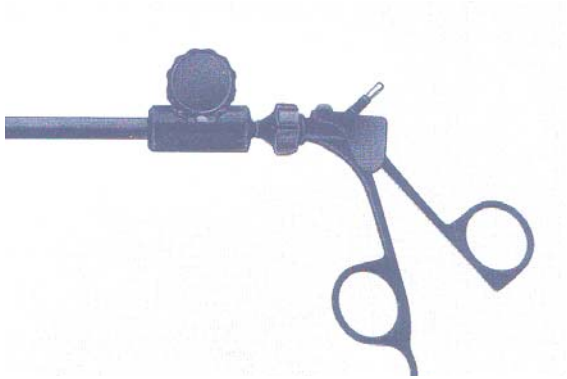
2.2.4.3: Sponge holder



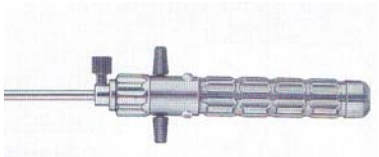
2.2.4.4: Scissors

It also has three parts;

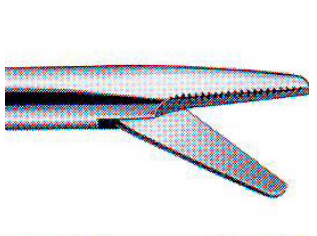
Handle may be ordinary

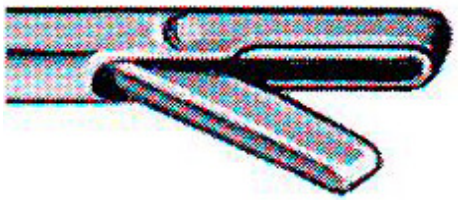


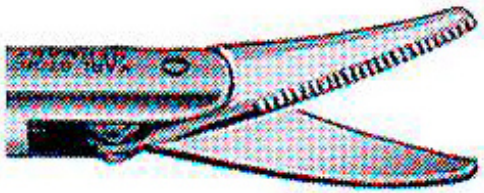
Or it may be slender

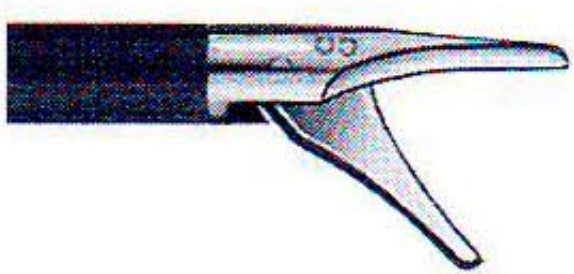


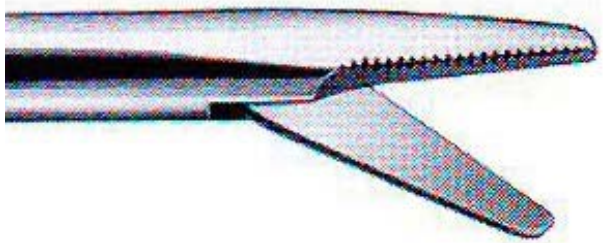
While the tip is of different type and sizes



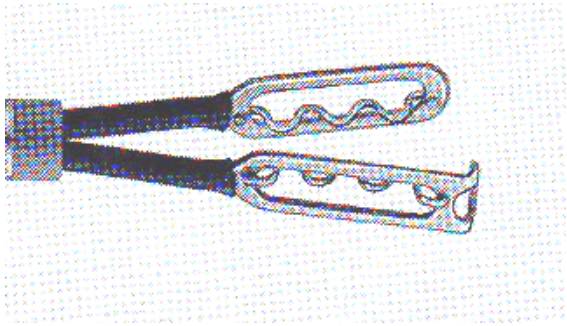


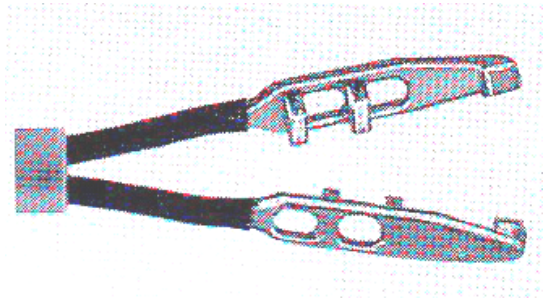


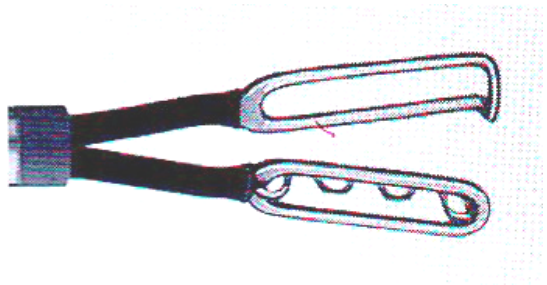




While the shaft in same in all types, but the tips are of different type and size.

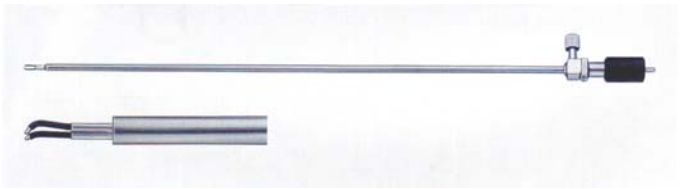




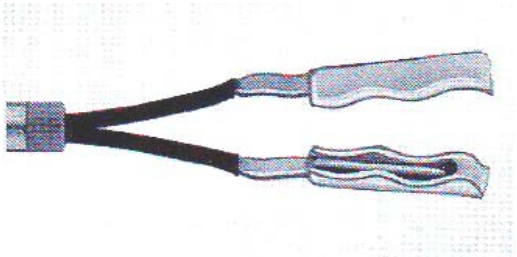


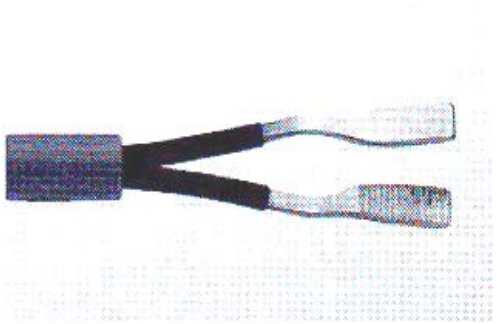
2.2.4.5: Coagulating instruments

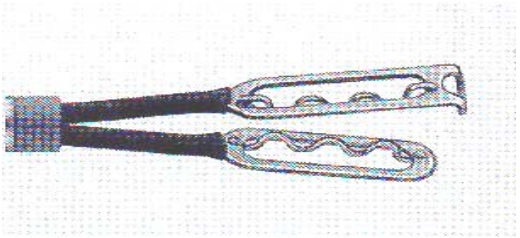
Also it consists of three part handle which is either slender

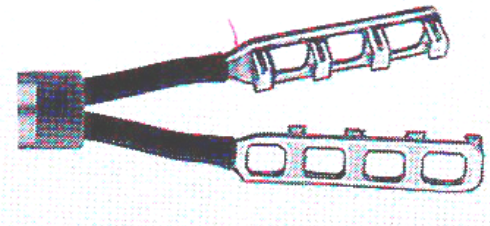


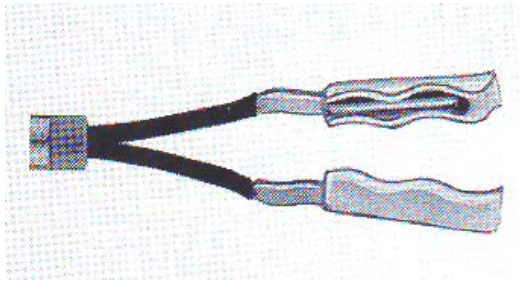
Or ordinary as other laparoscopic hand instruments,

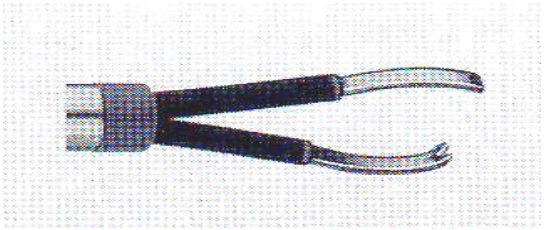


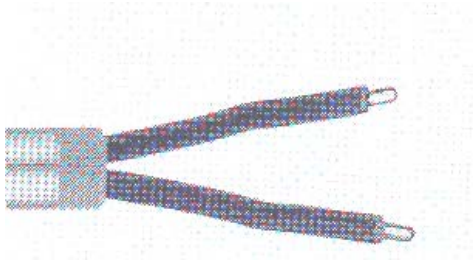


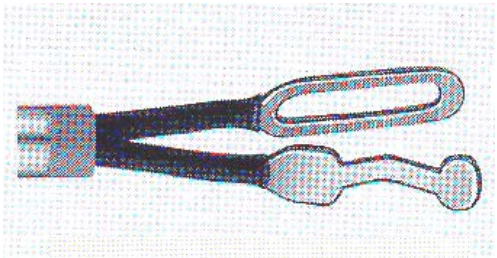


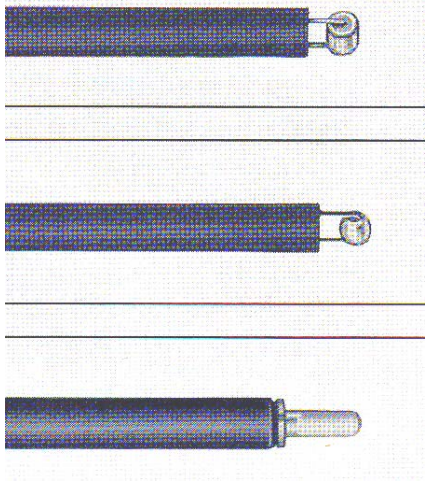


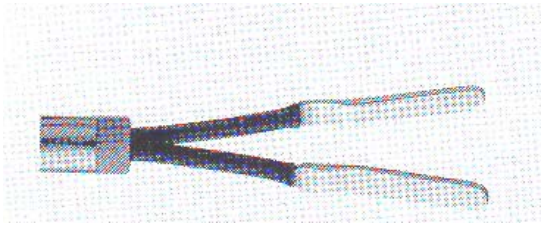


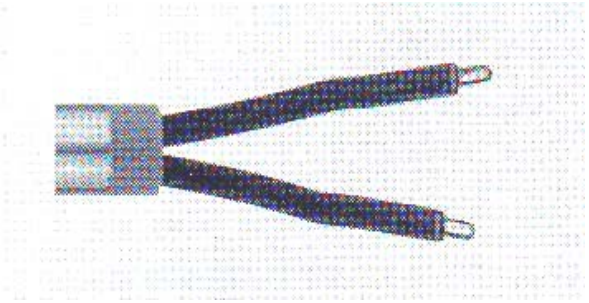


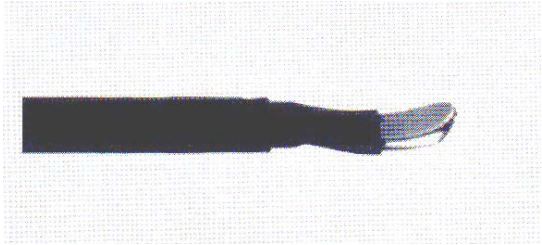




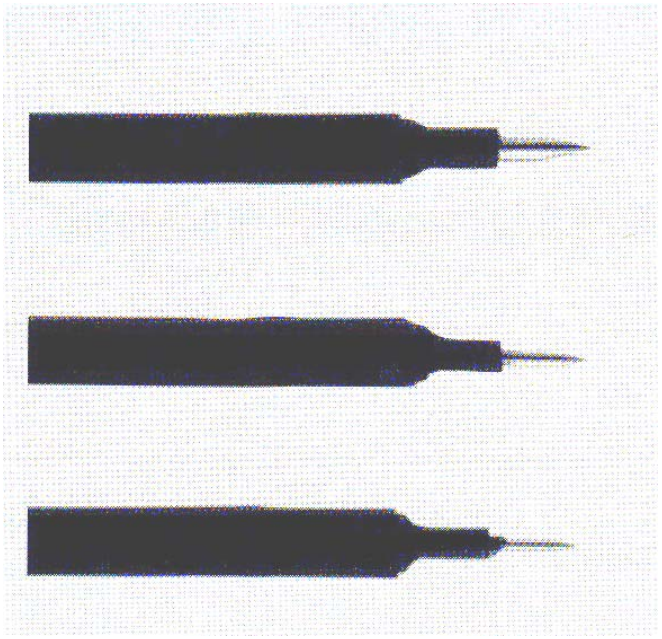




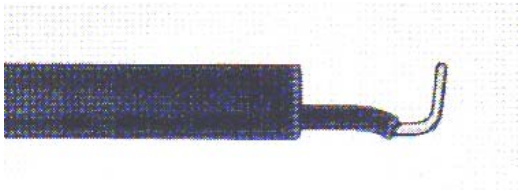


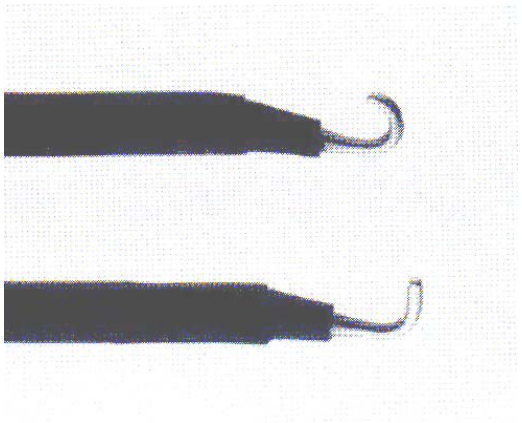


Some other has straight tip which used for puncturing cysts or tough capsules

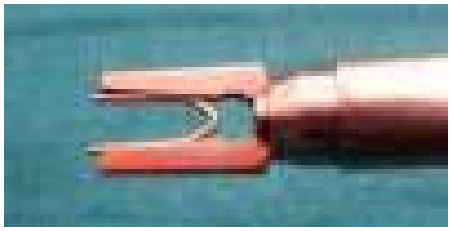


Some type hooked in the tip which used for dissection especially fine dissection of delicate structures or to pass under and coagulate delicate vessels

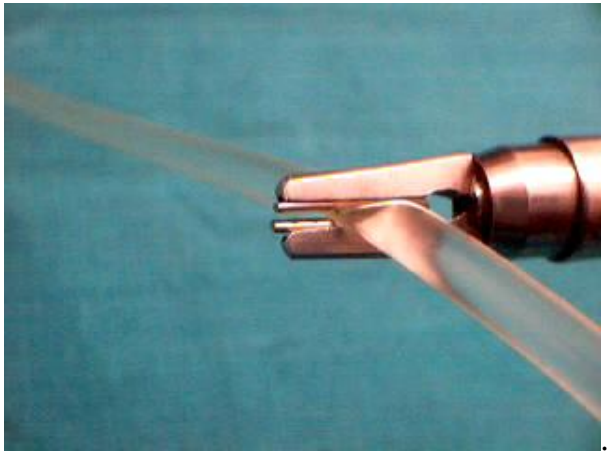




One type has a channel for irrigation which used for dissection and coagulation at same time

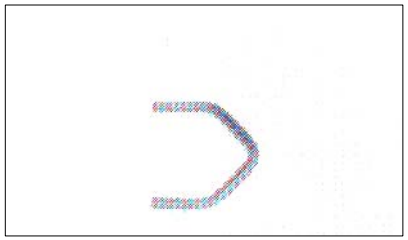


the jaws are placed around the vessel or the duct to be occluded and brought together by squeezing the instrument's handle, thus crushing the clip. They are either single reusable instruments which are reloaded after each application or disposable multiload appliers.



2.2.4.6: Clip and Clip Applier

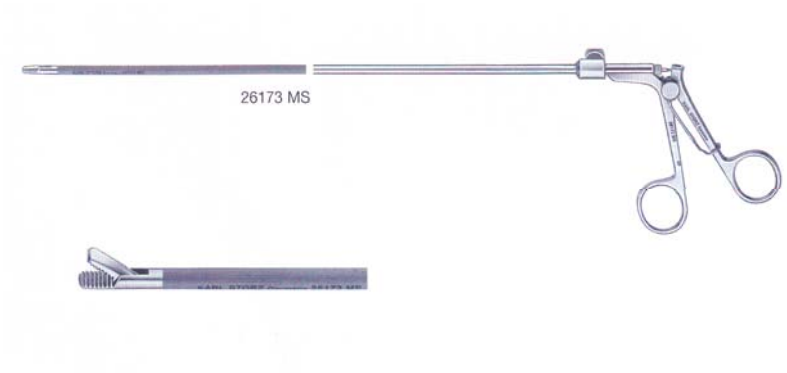
The application of small clip is adequate to completely occlude both artery and ducts like cystic duct. Two types of clip are available, one metal



The other manufactured from polydioxanone(PDS) ,which are 6 or 9 mm in length.

The metal clip appliers are 10mm instruments which introduce the clip into the abdomen in the open position,

Some new needle holders also capable on grasping of the sutures

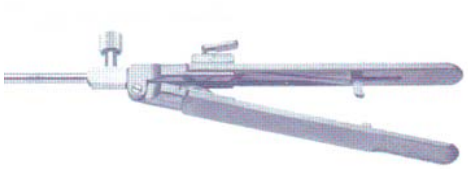


New generation needle holders are angulated, could be rotated to any wanted angle

Another type of needle holder has integrated scissors which saves the time of changing the needle holder to scissors.

2.2.4.7: Needle holder

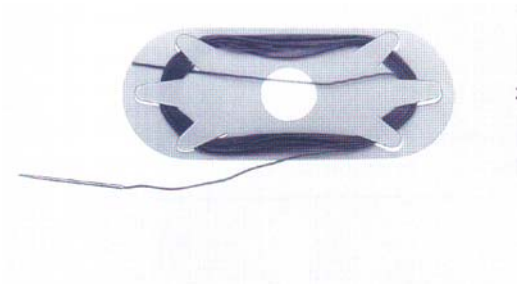
It composes of three parts handle is elongated with strong locking system and comfortable grip,



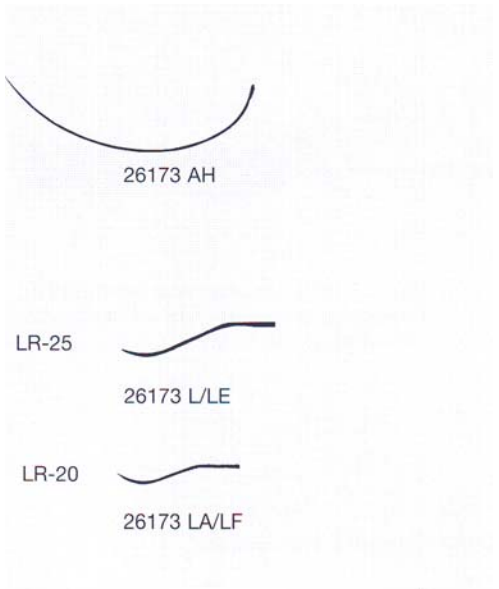
Shaft is same in all types while the tip is either curved or straight

Usually thy are sed in pairs one for rasping the eye end of the special laparocopic needle the other to grasp the tip of the needle after piercing the tissue

Either they are with thread or will be loaded with a thread after each use

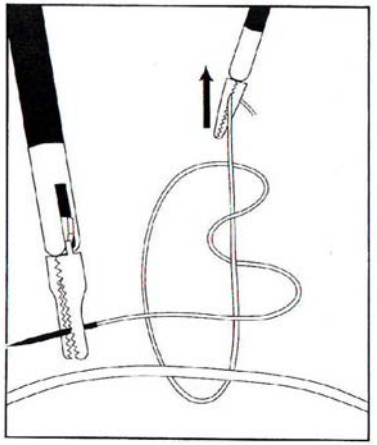


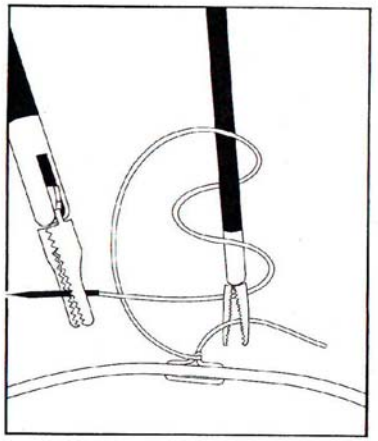
The needles are special and have different shape which is like a spoon



2.2.4.8: Knots

Different types of Knots may be used itra-abdominally



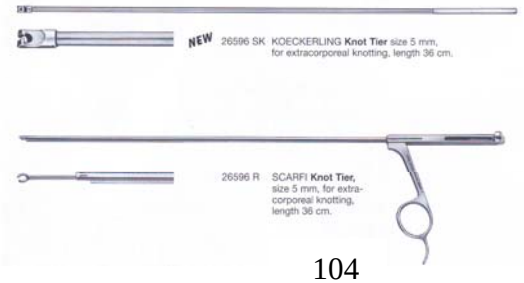


2.2.4.9: Knot holder

Ligatures inside the body cavity needs special instruments for holding them called knot holders

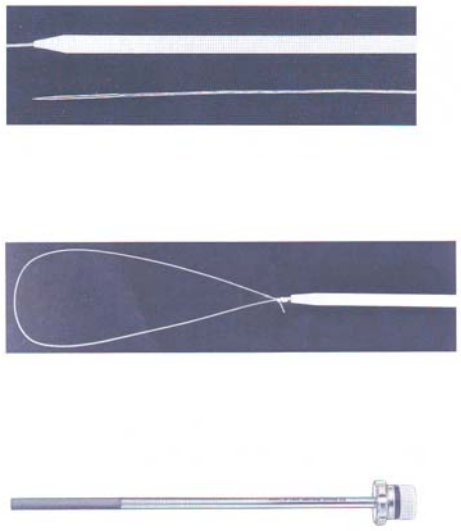
Also we need some instrument to push the knot to the desired point called knot pusher

And we need knot tier for secure knots



2.2.4.10: Endoloop

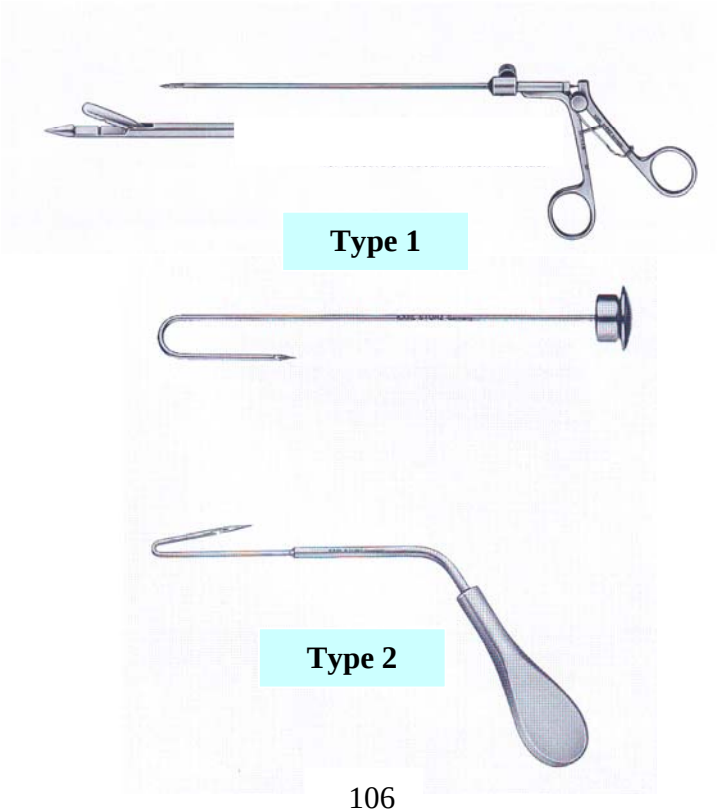
Ready threads in the form of prepared knot used for legation of a pedicle like appendicular stump

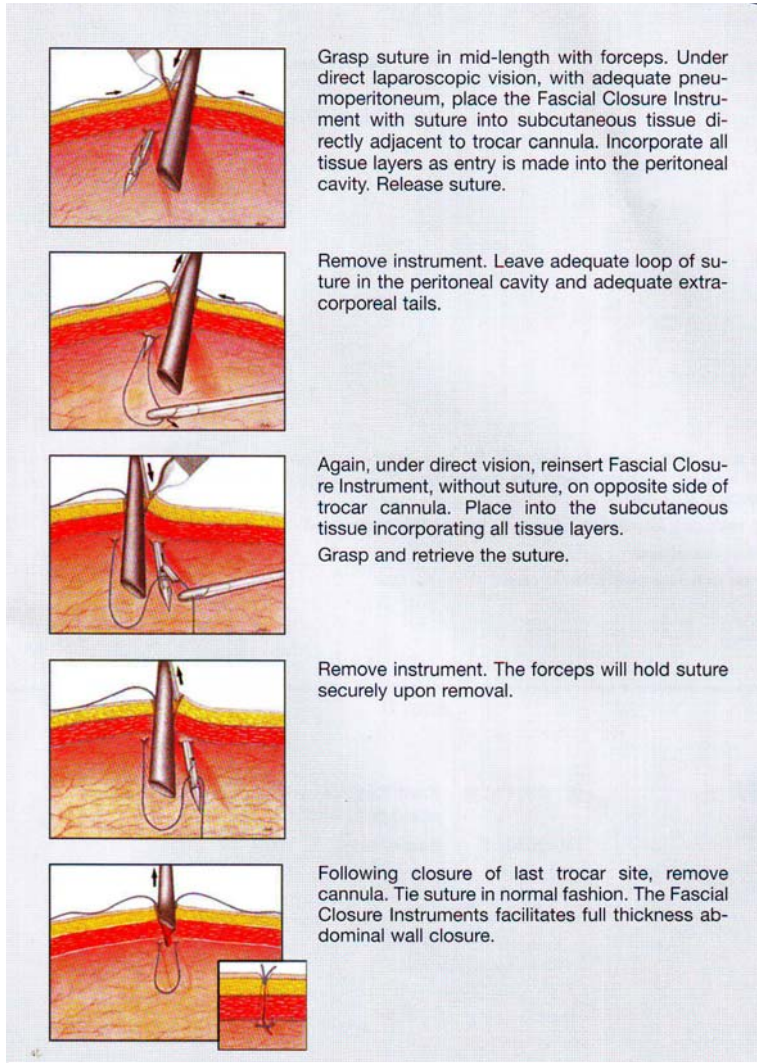


30140 KA **Applicator** for endo-ligature of bleeding vessels and for application of the 3 mm needle holder 26173 LS in trocar size 6 mm, color code: black.

2.2.4.11: Fascia Suturing

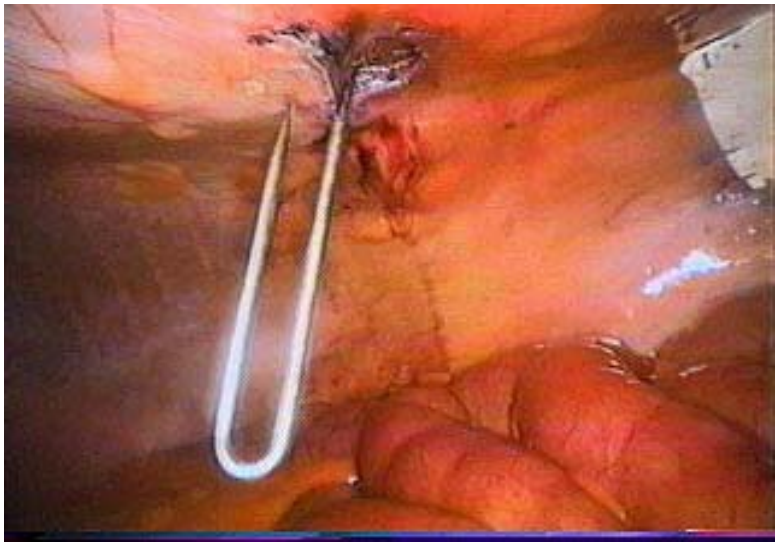
When 10mm trocar put or incision of 10mm trocar overstretched, there is possibility of hernia formation through the defect . So it is mandatory to suture the fascial defect.
We have two types o fascial suturing:



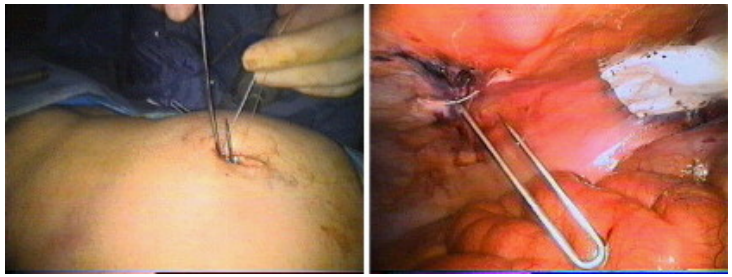


2.1: Fascial suturing with Type 1

The following pictures are showing suturing with Type 2

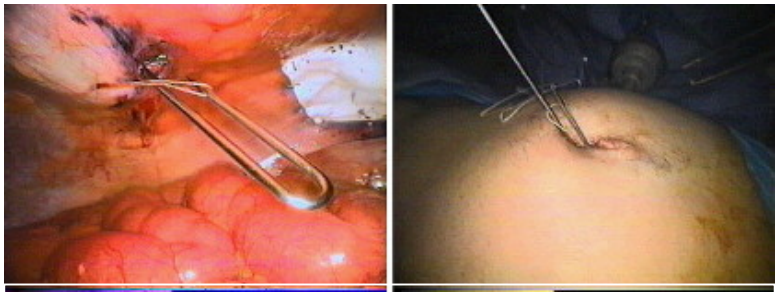


2.2:The trocar tube is removed and the J-needle is inserted through the incision under endoscopic guidance.
Gentle pressure is applied to the fascia as the needle is withdrawn, angling the needle so that it catches only the fascia and none of the subcutaneous tissue or skin



2.6: The only thing that now remains is to remove the J-needle. It is returned to the abdomen, and carefully positioned for removal, which can be the trickiest and sometimes most frustrating part of the procedure. By applying pressure to the back side of the "J," the needle can usually be freed from the incision

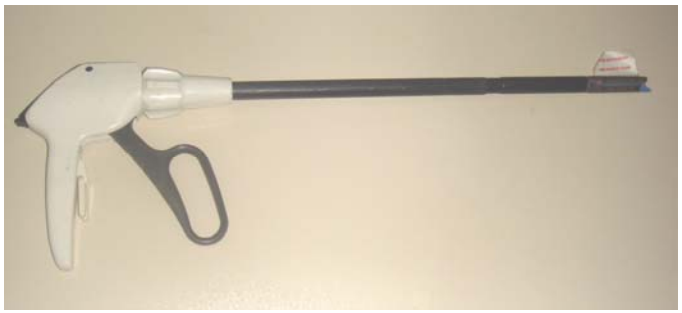
2.3: After withdrawing the needle, which has now engaged the fascia, the eye of the needle is threaded with a suture.

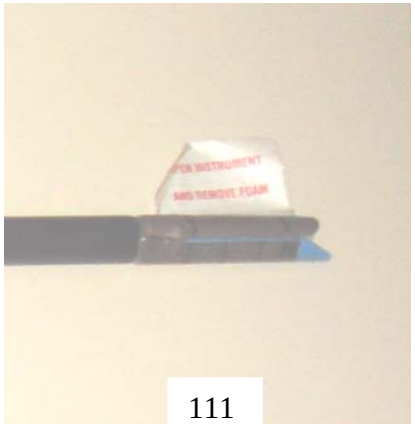


2.4: The threaded J-needle is then pushed back into the abdomen and rotated 180 degrees. The surgeon momentarily looks at the video screen to verify safe positioning of the needle. The rotated needle is then delivered back out of the incision, catching the other side of the fascia.

2.2.4.12: STAPLERS

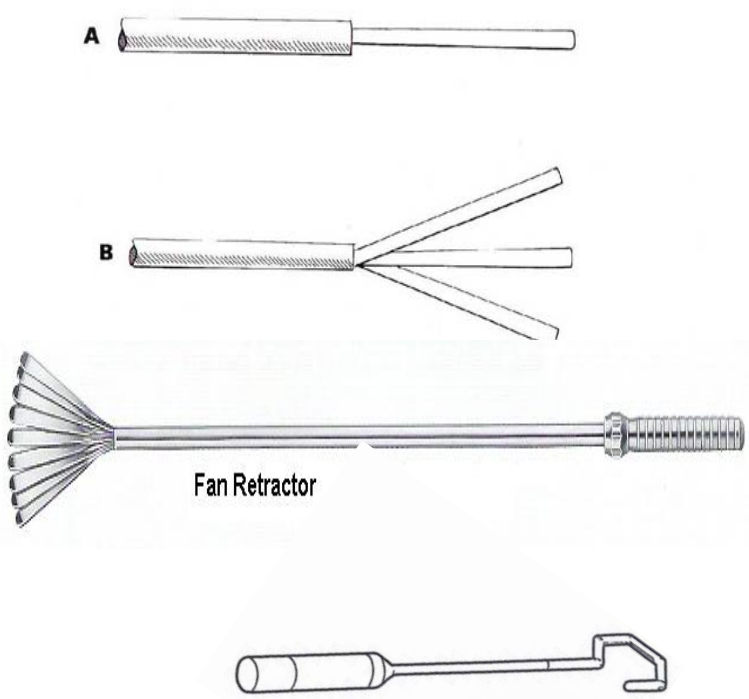
In some operation we need to suture ends or sides of bowel , may needs 30 or more stitches , needs experience and long time.
. Medical technology solved this problem by emerging of new instrument called staplers which cut and suture the tissue on shooting of the instrument after insertion. The tip of the staplers must be loaded by staples after each use





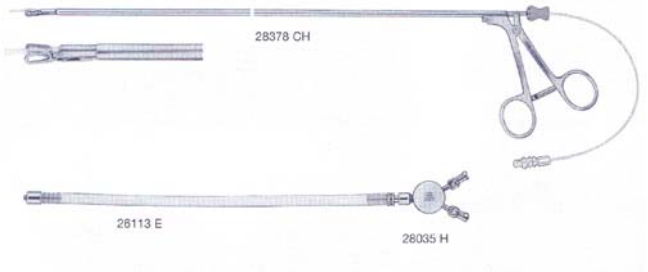
2.2.4.13: RETRACTORES

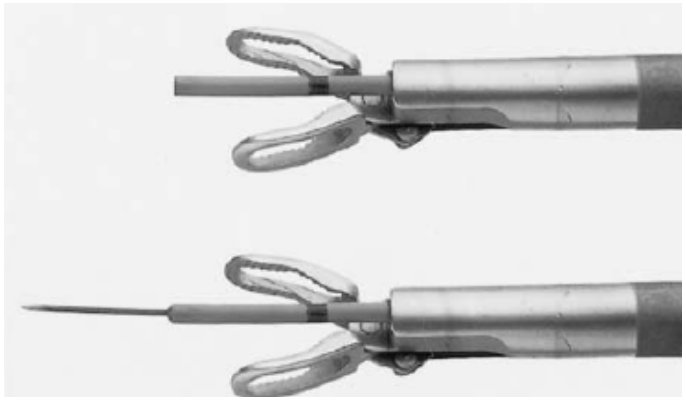
Blunt instruments to retract and restrain part of viscera in order to provide better access to the surgical site. Most of them have several fingerlike projections .could be inserted either via 5 or 10mm trocars



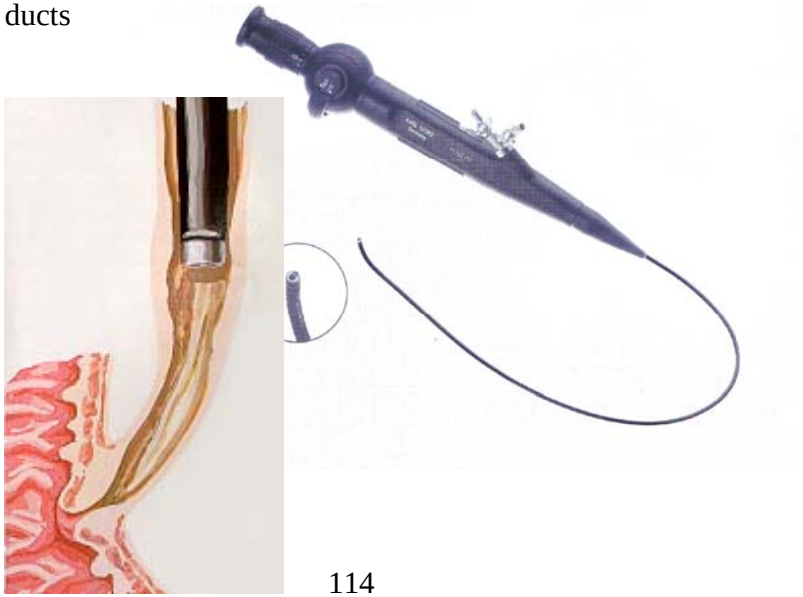
2.3: LAPROSCOPIC CHOLANGIOGRAPHY

During some laparoscopic cholecystectomy , the surgeon needs to gain an idea about extrahepatic biliary tree. This done by what is called laparoscopic operative cholangiography .
The water soluble dye could be injected in to the common bile duct(CBD) by two ways ;
1. Direct injection of the dye into the CBD
2. Via cystic duct.
The preferable way is to use Oslon clamp with a size 6G Chevaseau catheters. the clamp consist of hollow lightweight aluminum cylinder approximately 30 cm long with a caliber which fits a 5mm port snugly. The distal end of the clamp consists of pair of opposing U-shaped jaw parallel to the long axis of the instrument which are controlled using a finely graduated ratchet mechanism the handle of the clamp





Some time the surgeon needs to look inside of the bile ducts by special flexible endoscope called cholangioscope, could be introduced via 5mm cannula and second camera fitted to the eyepiece of the endoscope, helps in taking biopsy from inside the ducts



knowledge, technical skills, decision making, communication skills, and leadership skills. Technical skill consists of dexterity and judgment based on knowledge. Laparoscopic surgery requires specific skills in hand–eye co-ordination and due to the lack of manual contact with the tissue and the restricted instrument mobility, the need for specific training is obvious.

2.4: TRAINING EQUIPMENTS

Laparoscopy is an art to do great things through small openings

Surgical competence entails a combination of

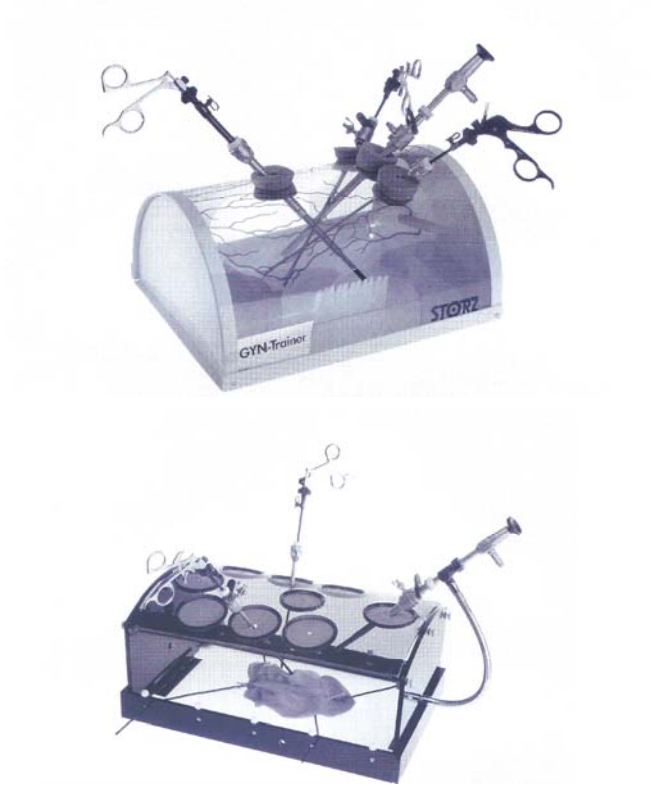
It has been shown that complication rates decreases sharply as more laparoscopic procedures are performed. Similarly the operation time is longer during the learning phase and decreases with experience.
Thus, it is of prime importance to ensure that a surgeon introduced to this particular operation is taught a correct technique. Few studies have focused on the actual learning process of a certain operation, although it is generally accepted that each procedure involves a specific learning curve, which is defined as the period before which acceptable quality is reached.
For all surgical procedures, a surgeon's learning curve can be anticipated. It has been proposed that the first 50 laparoscopic surgeries performed in a center and the first 20 performed by an individual surgeon present the highest risk for complications.
In the developed world training equipments became apart of any laparoscopic center.
The idea is to help beginners to pass the learning curve and period safely. This period considered to be the first 13 to 30 laparoscopy for any surgeons in which the morbidity may occur.

There are two types of laparoscopy trainers

2.4.1: Box trainers

Training involves the use of box trainers with either innate models or animal tissues; it lacks objective assessment of skill acquisition.

It is simple as shown in the following pictures, it is a container resembling the abdomen, and you could put any animal viscera in it. Through ready ports you could introduce the instruments and do the procedures



2.4.2: Simulator- based training

Second training equipment is sophisticated digital computerized system called laparoscopic simulator, which programmed in a way contains different operations,. When you train on it, the program will give you feedback and scores your job.
Simulator defined as “a task environment with sufficient realism to serve a desired purpose “
Undergoing structured training of basic skills training on the Minimally Invasive Surgical Trainer simulator (Mentice AB, Gothenburg, Sweden) followed by knot

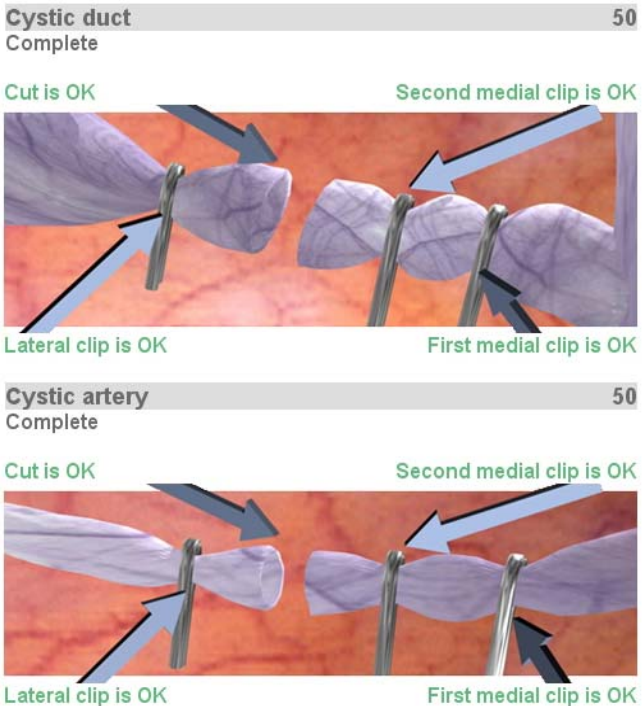
tying training on the LapSim simulator (Surgical Science, Gothenburg, Sweden).
The advanced Dundee endoscopic psychomotor

trainer (ADEPT) was originally designed as a tool for the selection of trainees for endoscopic surgery, based on the ability of psychomotor tests to predict innate ability to perform relevant tasks. Surgical simulators are convenient, flexible, and easier to standardize than their real-life counterparts.
Simulators claiming to be effective in the acquisition and evaluation of laparoscopic skill are not lacking. For minimally invasive surgery, they range from mirrored boxes to costly virtual reality interfaces, It is clear that practice on simulators improves performance on that simulator

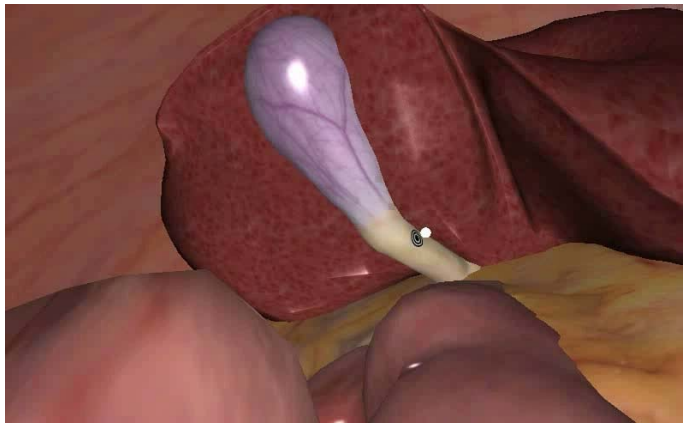
2.7: Programmed Simulator machine

Color Atlas of Laparoscopy

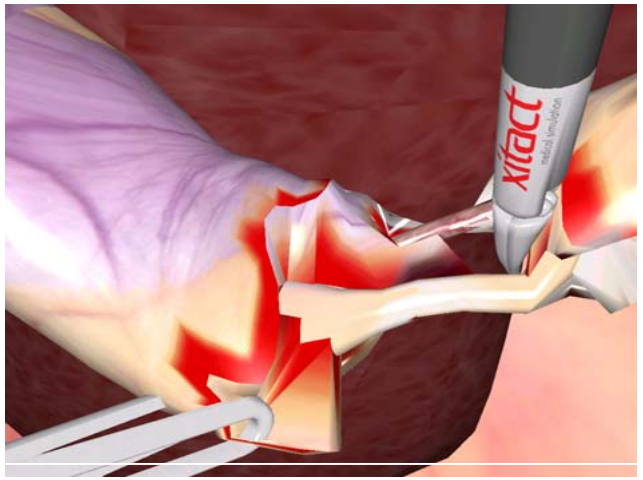
Chapter II Equipments and Instruments



2.10: Simulating cystic duct and artery clipping with scoring



2.8: Simulating Gall bladder and liver



2.9: Simulating hepato-duodenal ligament dissecting cystic duct

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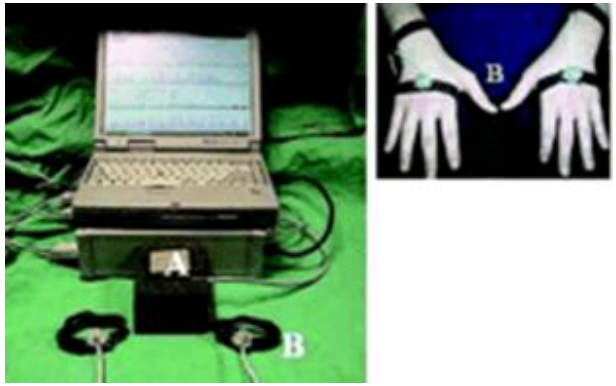
2.4.3: Virtual reality:

Virtual reality is defined as a collection of technologies that allow people to interact efficiently with three dimensional computerized databases in real time by using their natural senses and skills. Surgical virtual reality systems allow interaction to occur through an interface, such as a laparoscopic frame with modified laparoscopic instruments. The minimally invasive surgical trainer-virtual reality (MIST-VR) system was one of the first virtual reality laparoscopic simulators developed as a task trainer.



One of the main advantages of virtual reality systems, in comparison to dexterity analysis systems, is that they provide real time feedback about skill based errors.

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Color Atlas of Laparoscopy
Chapter III Anaesthesia

ANESTHESIA

POSITIONING OF THE PATIENT
POSOPERATIVE CARE

3.1: Anesthesia for laparoscopic surgery

Anesthetic management for patients undergoing laparoscopic surgery must accommodate surgical requirements and allow for physiological changes during surgery. Monitoring devices are available for early detection of complications the possibility of the procedure being converted to open laparotomy needs to be considered

Compared to laparotomy the major advantages are:

- Reduced tissue trauma required for surgical exposure so better cosmetic.
- Reduced wound size and post operative pain
- Improved post operative respiratory function: following open cholecystectomy FVC is

Reduced by approximately 50% and changes are still evident up to 72 h postoperatively. Following

laparoscopic cholecystectomy FVC is reduced by approximately 30% and is normal at 24 h postoperatively.

- Reduced post operative ileus.
- Earlier mobilization.
- Shorter hospital stay which resulting in reduction overall medical cost.

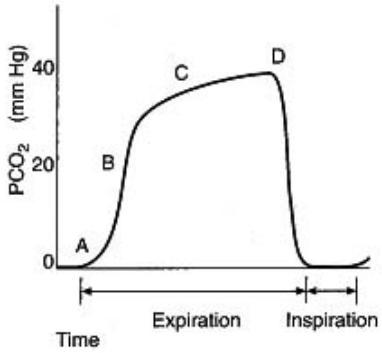
3.2: The following monitoring device should be routinely used at laparoscopic surgery:

3.2.1: Electrocardiogram

3.2.2: Sphygmomanometer
3.2.3: Airway pressure monitor
3.2.4: Pulse-oximeter

system for monitoring the concentration of exhaled CO_2, consisting of a sensor placed in the breathing circuit or a tube that carries part of the exhaled gases to the analyzing device, a mass spectrometer or an infrared spectrometer, and devices to provide continuous visual (cathode ray tube) and graphic (printer) displays.

Capnogram: a real-time waveform record of the concentration of CO_2 in the respiratory gases.



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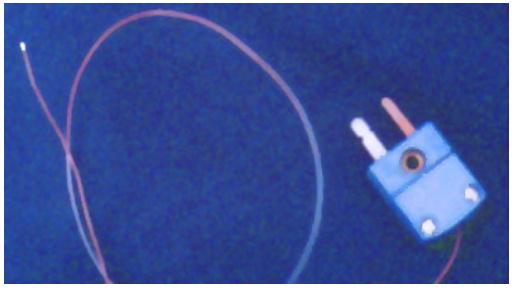
anatomic dead space;

- B : dead space and alveolar CO_2
- C : alveolar plateau
- D : end-tidal CO_2 tension ($PETCO_2$)

3.2.6: Peripheral nerve stimulator

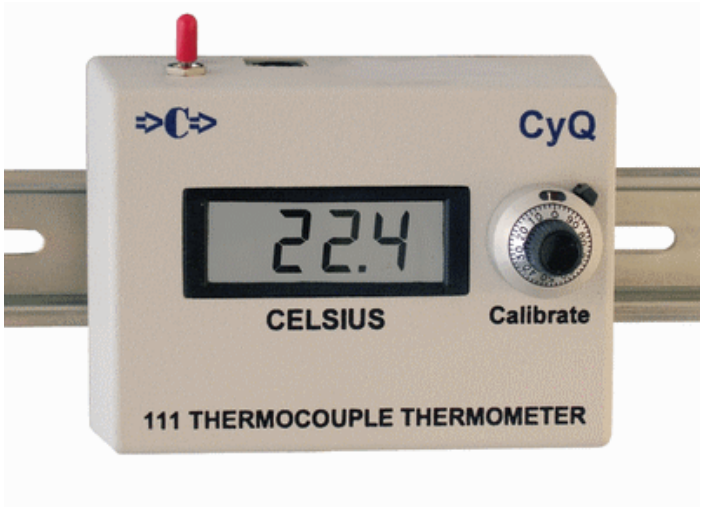
3.2.5: Capnography : End tidal CO2 concentration (PETCO2) monitor

: monitoring of the concentration of exhaled CO_2 in order to assess the physiologic status of patients with acute respiratory problems or who are receiving mechanical ventilation and to determine the adequacy of ventilation in anesthetized patients. Capnograph: a



In patient with sever cardiopulmonary compromise use intra-arterial blood pressure and CVP monitoring.

3.2.7: Body temperature probe



3.3: Intra-operative effects of laparoscopic surgery:

Pneumoperitoneum raises intra –abdominal pressure. Physiological changes are minimized if intra-abdominal pressure <15mmHg. This value should be monitored on the insuflation equipment.

Physiological effects include:

- Respiratory:

Diaphragmatic displacement, reduced lung volumes and compliance, increased airway resistance, increased ventilation/perfusion mismatch, hypoxia /hypercapnia from hypoventilation, increased risk of regurgitation.

- CVS:

Increased systemic vascular resistance raised mean arterial pressure, compression of inferior vena cava, reduced venous return, reduced cardiac output.

- Renal:

Reduced renal blood flow, reduced glomerular filtration rate, reduced urine output

3.4: Patient positioning .with upper abdominal procedures the patient is placed head up position .the usual tilt is 15-20 degrees .some left tilt is usual for cholecystectomy. This posture may further affect CVS.

Systematic carbon dioxide absorption may produce Hypercarbia and acidosis.

Extraperitoneal gas insuflation occurs through a misplaced trocar or when gas under pressure dissects through tissue defects. It may cause subcutaneous emphysema, pneumopericardium, or Pneumothorax.
Venous gas embolism may occur when trocar is inadvertently positioned in a vessel. Presents as acute right heart failure, reduce ETCO, arrhythmias, myocardial ischaemia, hypotension, elevated CVP.
Unintentional injuries to intra- abdominal structure – major vessels, viscera, liver and spleen. May not be detected during surgery but presents postoperatively with pain, hypotension, hypovolaemia, peritonitis, septicaemia.

3.5: Anaesthetic management

3.5.1: Preoperative

Contraindications to laparoscopic surgery are relative. Successful laparoscopic procedures have been carried out of patients who were anticoagulated, markedly obese, or pregnant.
Fit and young patients tolerate the physiological changes well.
Elderly patients and those with cardiac or pulmonary diseases have more marked and varied responses.
Caution should be taken in patients who were ASA>3, age>69years, those who had cardiac failure, and those with widespread ischaemic heart diseases.
Patients with marked respiratory or cardiac disease must be thoroughly reviewed and optimized

preoperatively and have surgeon experienced in the procedure as the operator. Beware of patients being admitted on the day of surgery without the appropriate preoperative preparation.
Prescribe paracetamol or diclofenac suppository preoperatively for post operative control.
Be prepared to convert to an open procedure (1-3%).

3.5.2: Perioperative

3.5.2.1: General anesthesia

Induction: intravenous induction with Propofol or barbiturate followed by intermediate acting non depolarizing muscle relaxant such as vecronium, atracurium or cisatracurium
Maintenance: with inhalational agent like Isoflurane or with intravenous infusion of Propofol.

Nasogastric tube: insert and aspirate. This deflates the stomach reducing the risk of gastric injury during trocar insertion and improves surgical exposure.

Nitrous oxide: Use of nitrous oxide is controversial because it may cause abdominal distension and predispose to nausea and vomiting

Opioids: Short acting opioids e.g. fentanyl, alfentanil can be used intraoperatively to cover what can be an intense but short-lived stimulus.

Fluids: avoid hypovolaemia as this exaggerates the CVS effects of the procedure

At end of operation encourage the surgeon to expel as much CO_2as possible to reduce pain. Injection of local anesthetic to the wound sites.

Remove the nasogastric tube before taking the patient to recovery.

3.5.2.2: Local or regional anesthesia

Epidural anesthesia has been used for selected patients successfully for laparoscopy. Unfortunately many patients cannot tolerate the abdominal distention if local anesthesia used alone.

If epidural anesthesia is to be used successfully a relatively high sensory block (T2-T4levels) is required.

A regional block to this level may impair the muscles of thorax which normally aid respiration, weakness of the respiratory muscles combined with the restrictive effect of Pneumoperitoneum and the absorption of carbon dioxide may result in hypercarbia.

Some discomfort may also still be felt during laparoscopy in spite of a high block due to stimulation of the vagus nerve from abdominal or intestinal distension.

3.5.3: Post operatively

Pain varies significantly and is worst in the first few hours postoperatively. It ranges from shoulder tip pain (diaphragmatic irritation) to deep seated pain from surgery.

Significant post operative pain extends beyond first day raises the possibility of intra-abdominal problems.

Prescribe regular paracetamol, diclofenac or ketorolac (with spamolytic in Cholecystectomy) to control post operative pain.

Nausea and vomiting give antiemetics intra operatively or post operatively.

3.6: Ten points to be kept in mind at time of laparoscopic surgery

1. All patients undergoing laparoscopy should have an empty bowel. In the unlikely event of bowel damage there is much less risk of contamination if the bowel is empty.
2. Good muscle relaxation reduces the intra abdominal pressure required for adequate working room in abdominal cavity.
3. The inflation of stomach should be avoided during artificial ventilation using mask as this increase the risk of gastric injury during trocar insertion or instrumentation.
4. Tracheal intubation and intermittent positive pressure ventilation should be routinely used.

5. The ventialtory pattern should be adjusted according to respiratory and haemodynamic performance of the individual patient.
6. Ventilation with large tidal volumes (12-15 ml/kg) prevents alveolar atelectasis and hypoxaemia and allows adequate alveolar ventilation and CO2 elimination.
7. Isoflurane is the preferred volatile anaesthetic agent in minimal access surgery as it has less arrhythmogenic and myocardial depressant effects also early recovery.
8. Excessive intravenous sedation should be avoided because it diminishes airways reflexes against pulmonary aspiration in the event of regurgitation.
9. Monitoring of PET CO2 is mandatory during laparoscopic surgery. The continuous monitoring of PET CO2 allows adjustment of the minute ventilation to maintain normal concentration of carbon dioxide and oxygen.
10. Airway pressure monitor is mandatory for anesthetized patients receiving intermittent positive pressure ventilation.

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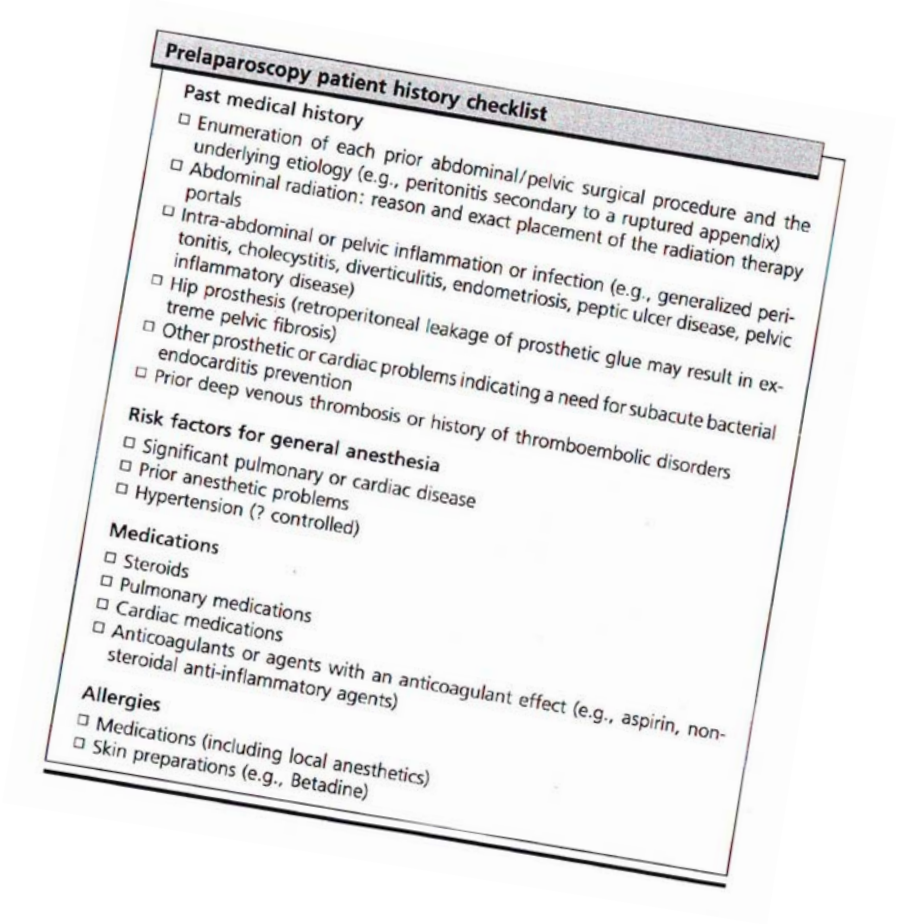


Prelaparoscopy patient history checklist

Past medical history

- ☐ Enumeration of each prior abdominal/pelvic surgical procedure and the underlying etiology (e.g., peritonitis secondary to a ruptured appendix)
- ☐ Abdominal radiation: reason and exact placement of the radiation therapy portals
- ☐ Intra-abdominal or pelvic inflammation or infection (e.g., generalized peritonitis, cholecystitis, diverticulitis, endometriosis, peptic ulcer disease, pelvic inflammatory disease)
- ☐ Hip prosthesis (retroperitoneal leakage of prosthetic glue may result in extreme pelvic fibrosis)
- ☐ Other prosthetic or cardiac problems indicating a need for subacute bacterial endocarditis prevention
- ☐ Prior deep venous thrombosis or history of thromboembolic disorders

Risk factors for general anesthesia

- ☐ Significant pulmonary or cardiac disease
- ☐ Prior anesthetic problems
- ☐ Hypertension (? controlled)

Medications

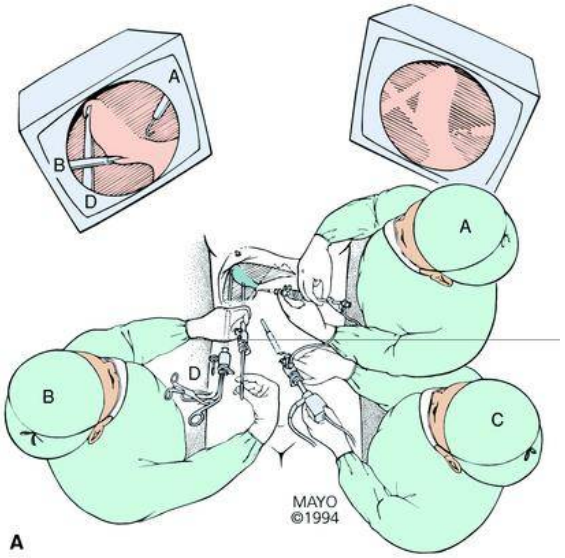
- ☐ Steroids
- ☐ Pulmonary medications
- ☐ Cardiac medications
- ☐ Anticoagulants or agents with an anticoagulant effect (e.g., aspirin, non-steroidal anti-inflammatory agents)

Allergies

- ☐ Medications (including local anesthetics)
- ☐ Skin preparations (e.g., Betadine)

LAPAROSCOPY IN GENERAL

We put well prepared patient in supine position, after general endotracheal anesthesia, giving peri-operative antibiotics (Gentamicine 80mg-+Cefataxime 1000mg): e do the laparoscopy as following;



4.2: Operative room setup for Laparoscopy in general

Prelaparoscopy physical examination checklist

General
- ☐ Blood pressure: rule out uncontrolled hypertension
- ☐ Temperature: rule out sepsis
- ☐ Pulse: rule out uncorrected cardiac dysrhythmias

Chest and cardiac examination
- ☐ Routine examination to determine suitability for a general anesthetic

Abdominal and pelvic examination

Inspection
- ☐ Site of prior incisions
- ☐ Umbilical abnormalities
- ☐ Umbilical hernia
- ☐ Incisional hernia

Palpation
- ☐ Intra-abdominal mass
- ☐ Abdominal tenderness: localized, general/deep, or rebound
- ☐ Umbilical hernia
- ☐ Incisional hernia
- ☐ Widened aortic pulsation (rule out abdominal aortic aneurysm)
- ☐ Fixed or frozen pelvis on vaginal/rectal examination

Auscultation
- ☐ Bruits indicative of aortic or iliac/femoral artery aneurysms
- ☐ Bowel sounds (rule out obstruction)

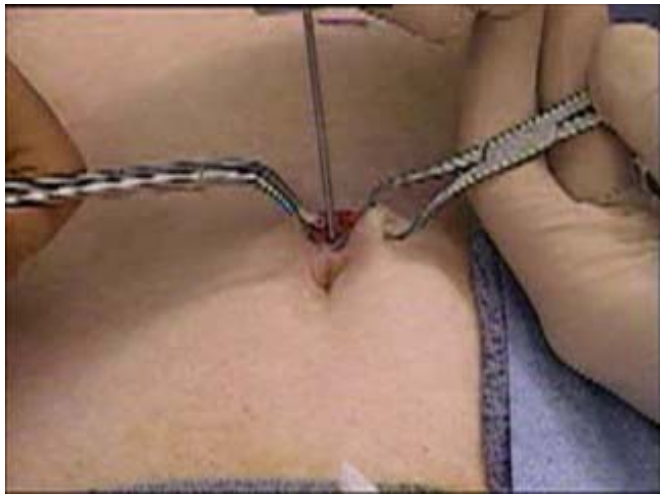
4.1: Pre laparoscopy Examination

*** On table shaving and Disinfection of the field of the surgery**
*** Draping**
*** Nasogastric tube (for not fully fasting patient: emergency and in upper abdominal procedures) will be inserted**
*** Urinary catheter in lower abdominal procedures**
*** Pneumoperitonium**

4.3: Small incision for insertion of Veress needle

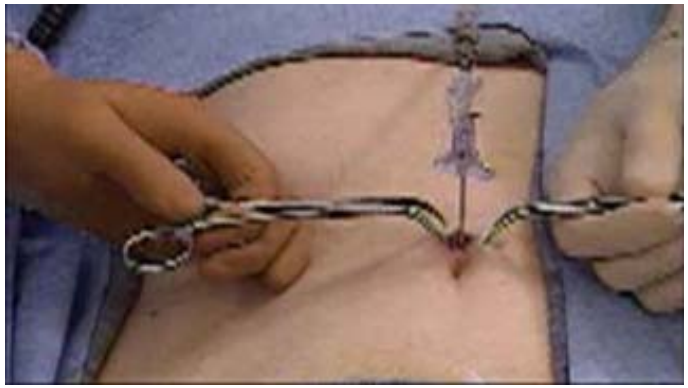
Tiny stab incision by No.12 blade below or above or via umbilicus, 14-guageor 2mm in diameter (6 Fr) Veress needle pressed in the wound 45 degree caudal, in obese patients press perpendicularly. As the needle entered peritoneal cavity, 10cc syringe with 5 cc of saline is connected to the Veress needle, aspirate, and

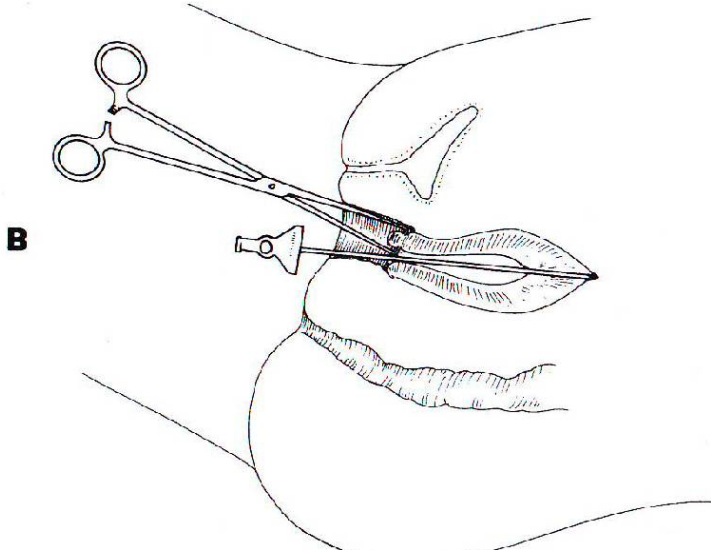
inject the saline then aspirate, no fluid will be aspirated.



4.4: Insertion of Veress needle

Once we are sure that the tip is in the peritoneal cavity, needle connected to the CO_2 tube.





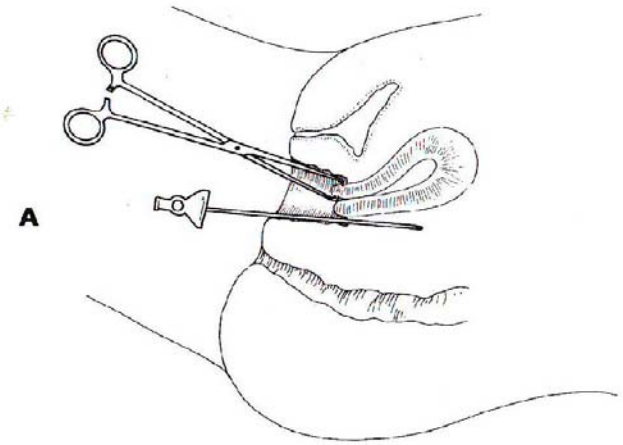
4.6: Insertion of Veress needle Through Uterus

POSITIONING
According t the procedure, the patient put in different position, for example: head up and turning the table to left. For Appendectomy headdown and turning the table to left…etc**.**

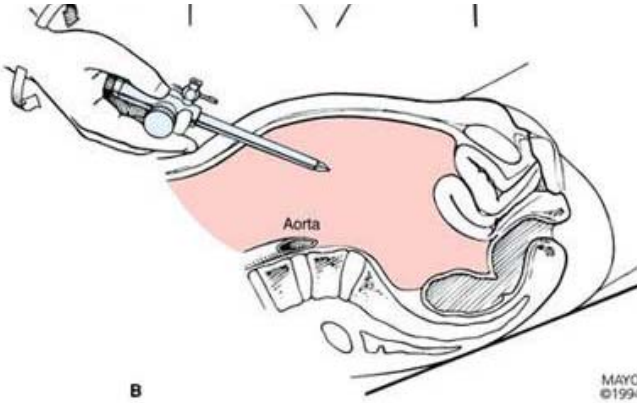
TROCARS;
Number and site of the trocars are different according to the type of the operation i.e.

The flow must be set to less than one liter per minute. and initially the intraabdominal pressure must be less than 10mm Hg, then the flow set to 6L/min, till the intraabdominal pressure become 15mmHg , this means approximately 3-6L of CO_2 have been instilled into peritoneal cavity

Alternatives;
In selected female patients ,instillation done by passing the needle via posterior fornix of vagina, in the midline to depth of 3 cm, which both safe and effective **.**

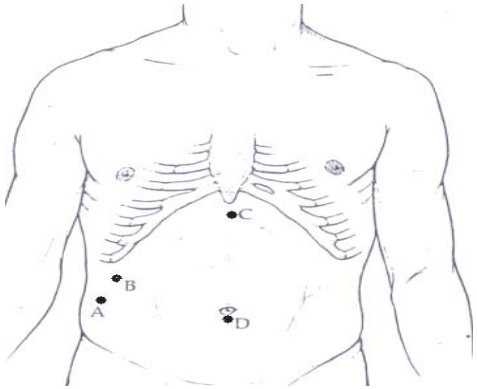


4.5: Insertion of Veress needle Through Fornix



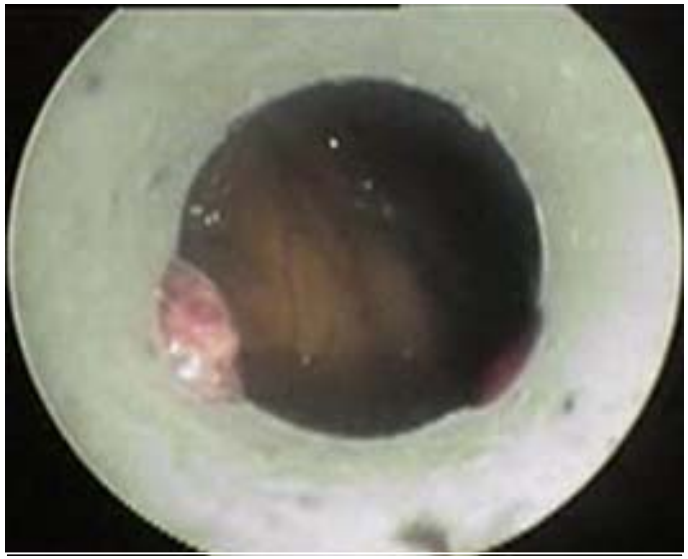
4.9: Then obturator of the trocar removed

And the side of the trocar connecting with the insufflators



4.7: For laparoscopic cholcystectomy we put 4 trocars ,first above umbilicus via 1cm incision

4.8Insertion of the first trocar



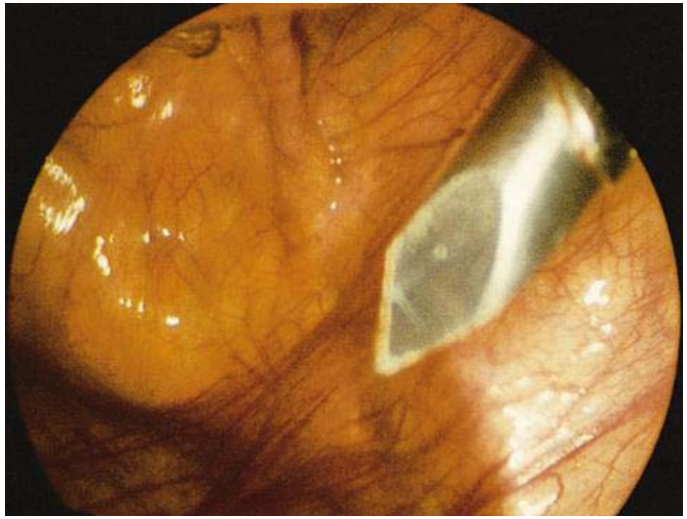
4.10: Now we introduce the telescope via the sheath first trocar

4.11: Insertion of the telescope via first trocar

4.12: Inside view of the trocar

4.13: View of the liver and gall-bladder

Second trocar put via 10mm incision at point in the midline 6cm below xiphisternum,

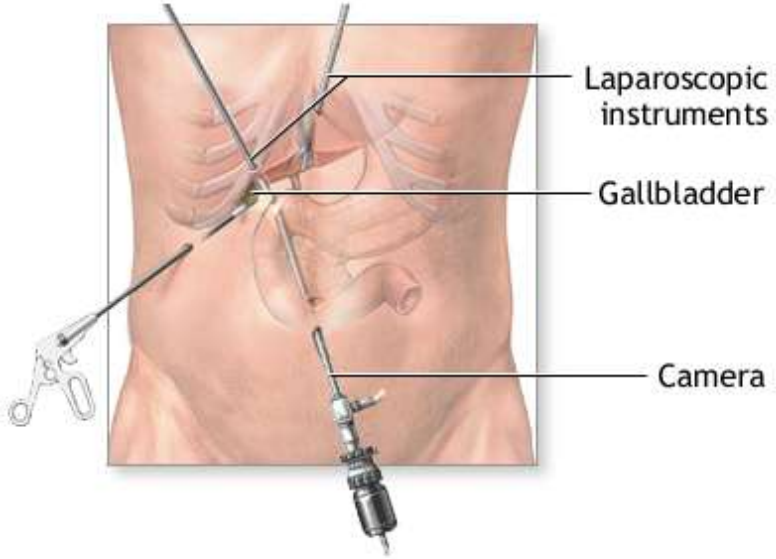


4.14: Insertion of 2nd trocar under direct vision

Third trocar put just below costal margin at right midclavicular line, fourth at midaxillary line at level of umbilicus. 3rd & 4th trocars are 5mm without sidearm for CO_2 insufflation. To avoid injury to any superficial abdominal wall vessels, the room light turned off, by help of the light of the scope the site transilluminated from inside the abdomen
First trocar is usually put blindly after obtaining pneumoperitonium which is 10mm in diameter with side arm for CO_2 insufflation , while others put under

direct vision as long as we introduced the laparoscope via first trocar

The angle of insertion of periumbilical trocar is 90 degrees at the start, once the tip of the obturator passed skin and subcutaneous fat; it must be tilted to 60-70 degrees angle,
It is better to direct all the port toward the site of the operation



4.15: Diagram showing all the trocars in place

4.16: Removal of the trocars under direct vision and inspecting the ports

POST_OPERATIVE CARE

- **the patient ambulated within 2-3hours**
- **after 2 hours oral fluid started, regular meal allowed after 6 hours**
- **completion of peri-operative antibiotics**
- **non-opiate Analgesia (spasmolytic for biliary surgery)**
- **Send home in few hour when fulfilling criteria of daycare discharge**

Hasson open cannula insertion;
A transverse periumbilical incision made 2cm in length, under direct vision deepened to peritoneum, which must be grasped by hemostats and opened , then 0 absorbable suture placed on either side of the incised fascia and the trocar inserted .this give opportunity for faster pneumoperitonium.

FORMAL LAPAROSCOPY
After confirmation of right insertion of the rest of the trocars, we examine the viscera systematically, first lower abdomen then upper abdomen.

Exiting of the abdomen
At the en of the operation, second look of the surgical field is mandatory to find any bleeding or injuries, then intraabdominal pressure lowered to 5mmhg to allow any bleeding from injured veins .Now the peritoneum, particularly site of the operation irrigated by 500 to 2000cc of fluid, we examined area again for any features of injury and aspirate as much as possible from irrigated fluid

Withdrawal of the sheath of the trocars
We usually inspect the site of the trocars and withdraw them under direct vision , the last of the scope port withdrawed slowly with the telescope. The fascial defect of 10mm trocar not needs closure, on theoretical grounds alone we cannot see the closure of 1 cm defect

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Color Atlas of Laparoscopy

Chapter IV Laparoscopy in General

DIAGNOSTIC LAPAROSCOPY

5.1: Finding of Formal Laparoscopy

Laparoscopy started by inserting the telescope via periumbilical port, inspecting all the abdominal viscera. Some time we need to put second trocar for insertion of holding and grasping forceps or retractor, biopsy forceps, irrigation or suction head. When changed to therapeutic another trocar may be inserted for completion of the procedure.

5.1; Showing carcinomatosis of the interior of the abdominal wall

DIAGNOSTIC LAPAROSCOPY

5.2: Showing carcinomatosis of the interior of the abdominal wall

5.3: Showing adhesions of the omentum, with liver and parities

5.4: Showing carcinomatosis of the interior of the abdominal wall

5.5: Showing carcinomatosis with adhesion of omentum to liver secondary

5.8: Showing ascites

5.9: Showing dilated veins on the hepatic flexure

5.6: Showing secondary (metastasis) in the liver

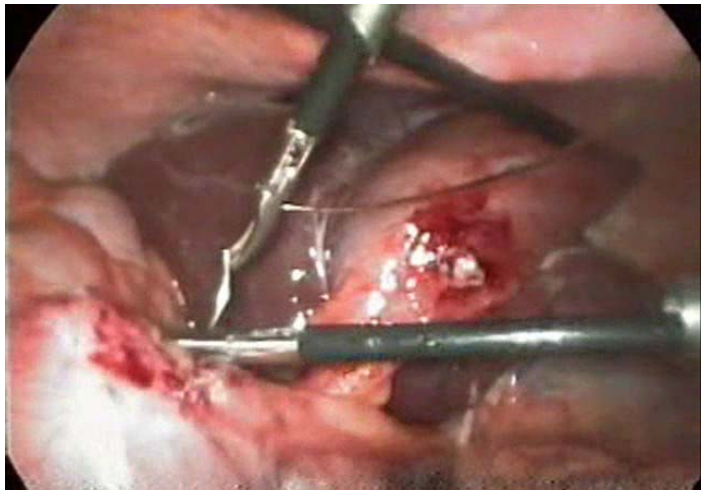
5.7: Showing secondary (metastasis) in the liver

5.10: Showing dilated veins, one in the center 7mm in diameter (Portal Hypertension)

5.11: Showing normal liver

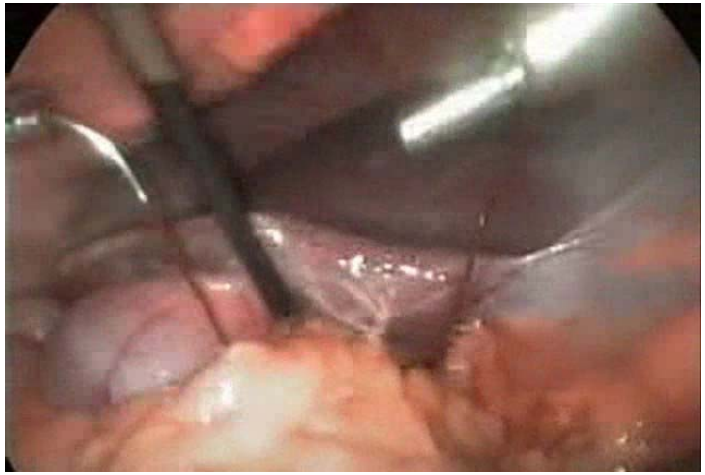
5.12: Showing acutely inflamed

5.13: Showing varicose veins in the wall of the gallbladder



5.14: Showing perforated duodenal ulcer

5.15: Showing bile coming out from perforated duodenal ulcer



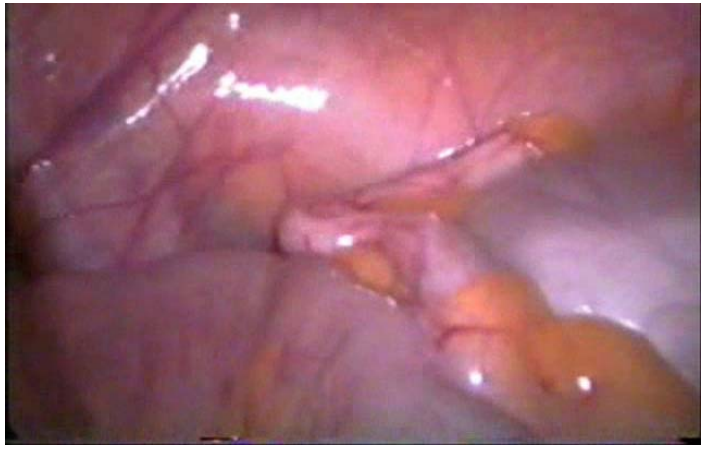
5.16: Showing plication with chromic catgut

5.17: Showing Graham patch of omentum put on the perforated Ulcer

5.18: Showing completion of Graham patch and plication

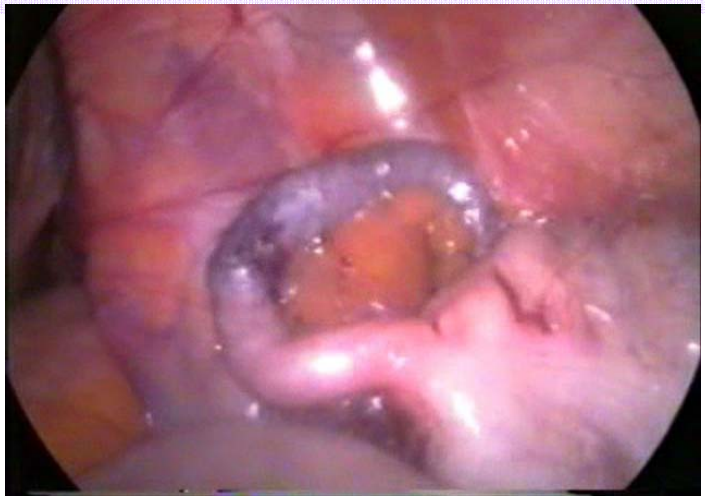
5.19: Showing severe adhesion between loops of bowel

5.20: Showing severe adhesions



5.21: Showing inflamed appendix

5.24: Showing suppurative appendicitis

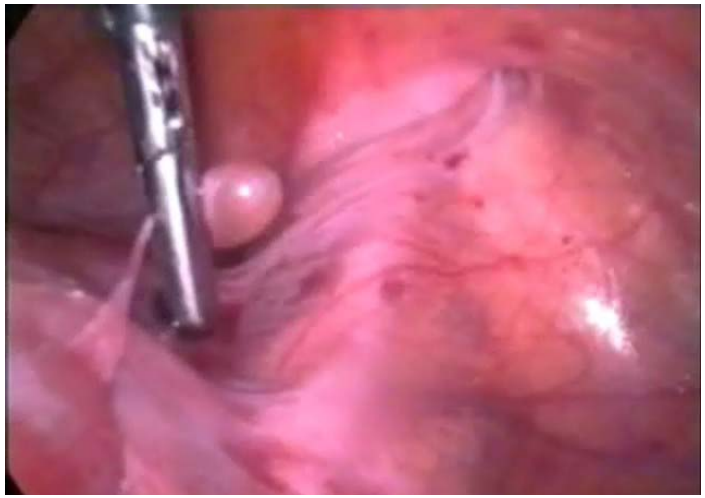


5.25: Showing gangrenous appendix

5.22: Showing inflamed appendix

5.23: Showing normal appendix

5.28: Showing normal left ovary



5.29: Showing Para-ovarian cyst

5.26: Showing blood in cul de sac

5.27: Showing gravid uterus

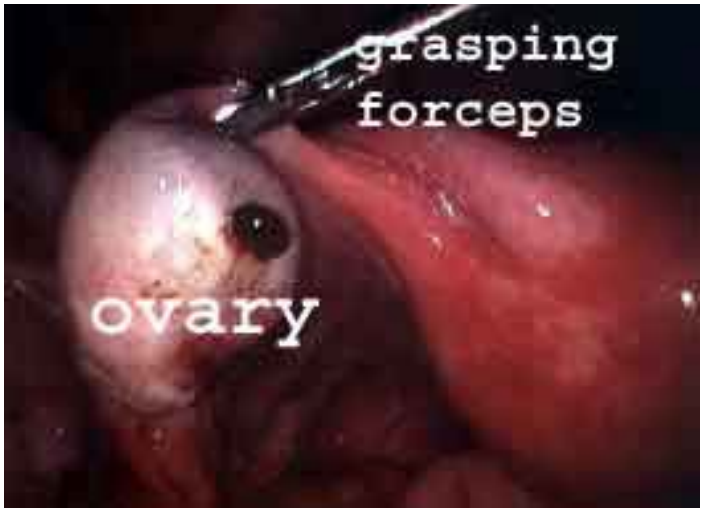
5.30: Showing right oviduct with large ovary

5.31: Showing Ruptured right ovarian follicular cyst (same patient of previous picture)

5.32: Showing contents o the cyst of previous picture

5.33: Showing Ruptured Ectopic tubal pregnancy

5.34: Showing Endometriosis in the peritoneum



5.35: Showing Endometriosis on the left ovary

5.36: Showing right hydrosalpinx

5.2: BIOPSY

Laparoscopy allows direct examination of large portions of the surface area of the liver, gallbladder , spleen, peritoneum, and pelvic organs.

The addition of directed biopsy increases diagnostic accuracy.. Despite the advent of newer
imaging techniques (e.g., computerized tomography, ultrasonography, magnetic resonance imaging), with Fine needle biopsy capability, laparoscopy remains a valuable tool when appropriately applied in a thoughtful diagnostic plan. When clinically indicated, even when body imaging methods are negative, laparoscopy can provide more accurate and definitive diagnostic and staging information.

5.37: Showing taking pinch biopsy from a liver mass

5.38: Showing taking biopsy by electrocautery from the liver

5.39: Showing biopsy sample from the liver

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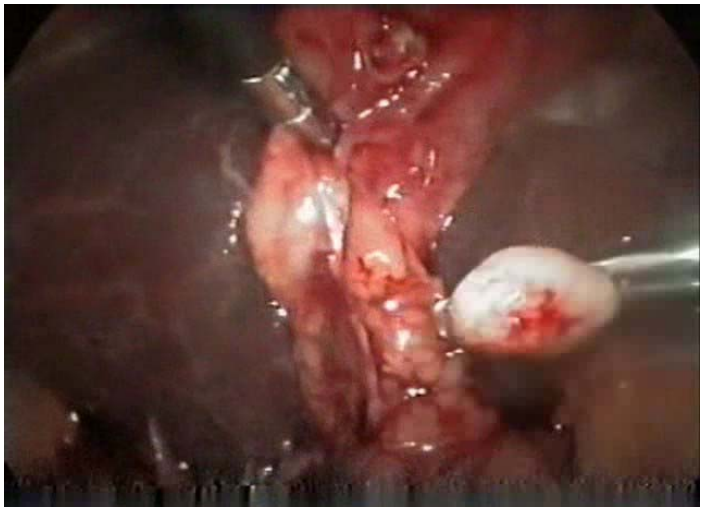

5.40: Showing taking Lymph node biopsy from porta hepatis

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LAPAROSCOPIC PROCEDURES

1. Cholecystectomy
2. Appendectomy
3. Hernia repair
   - Inguinal
   - Ventral
4. Fundoplications
5. Morbid Obesity

Laparoscopic cholecystectomy (LC) is the gold standard technique for symptomatic cholelithiasis and one of the most frequently performed procedures in surgery. LC has substituted traditional cholecystectomy due to a more comfortable postoperative period than the open approach . Many authors have evaluated the safety and the initial results of LC in the ambulatory setting. However, ambulatory LC remains controversial. In the USA, LC is regularly performed as a day care procedure in patients with uncomplicated gallstone disease.

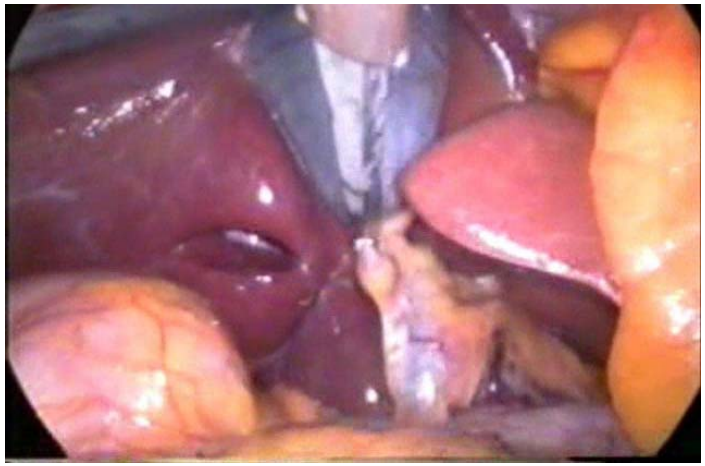
The results of LC in day-care facilities are publications on ambulatory LC have focused on the need for selection criteria and in the safety of the ambulatory management. LC for symptomatic cholelithiasis is safe and feasible; it should be the first choice before resorting to open surgery. In patients with acute cholecystitis as compared to chronic choleystitis, there is an increased conversion rate, longer operation time, longer hospital stay, and higher incidence of gallbladder perforation without an increase in the incidence of bile duct injuries (BDI). Male

6.1.1: LAPAROSCOPIC COLECYSTECTOMY

Since Mouret performed the first laparoscopic cholecystectomy in 1989 in Lyon, France, this laparoscopic procedure has become the standard surgical treatment worldwide for biliary cholelithiasis. The new technique was used for many intra-abdominal benign lesions, including inguinal hernia repair, Nissen procedure, gastric banding for morbid obesity, splenectomy, living donor of kidney, spinal disease and in the gynecological fields. The first reported laparoscopic colorectal surgery for malignant colon lesions was done by Jacob in 1991, and these issues become of concern again and again.

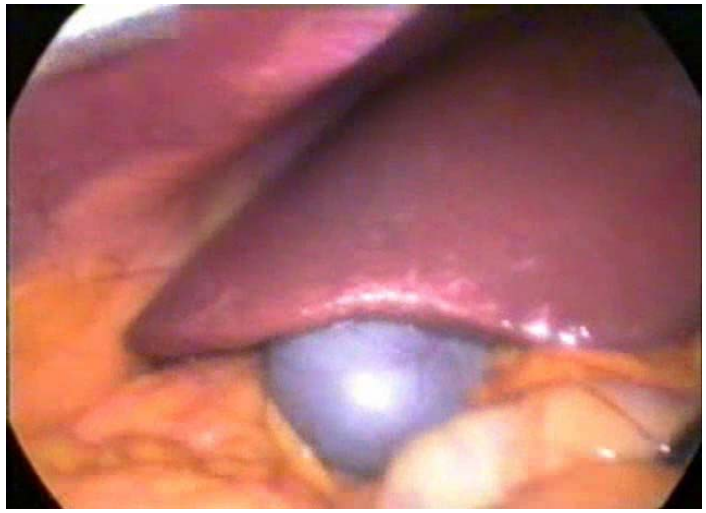
In 1994, Berends reported 21% port site metastasis afte rlaparoscopic surgery for colorectal cancer.2 Some surgeons Stopped doing the operation, but other vigorous enthusiastic

6.1.1.3: Grasping the body temporarily for better grasp of the Hartman's"



6.1.1.4: Grasping the Hartman's pouch

patients have a longer operation time and higher conversion rate than female patient



6.1.1.1; Showing laparoscopic view of liver and gallbladder

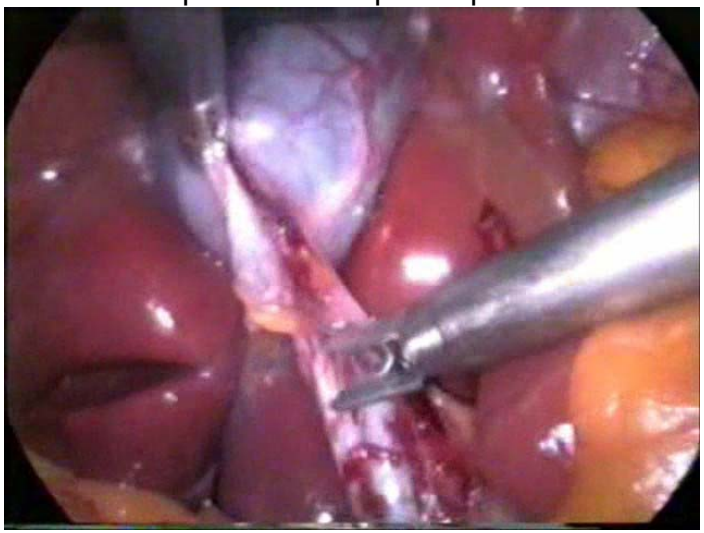
6.1.1.2: Grasping gallbladder in the fundus

6.1.1.7: Making a window in the peritoneal covering at neck of the

6.1.1.8: Exploration of the cystic duct

6.1.1.5: Showing hepatoduodenal ligament

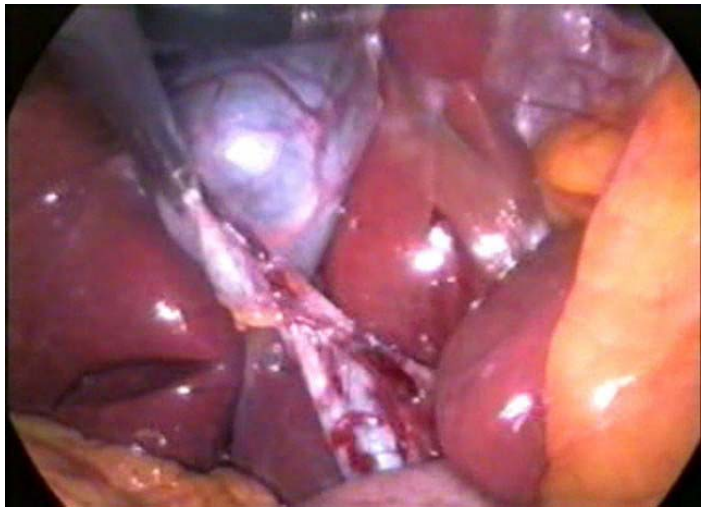
6.1.1.6; Dissection cystic duct



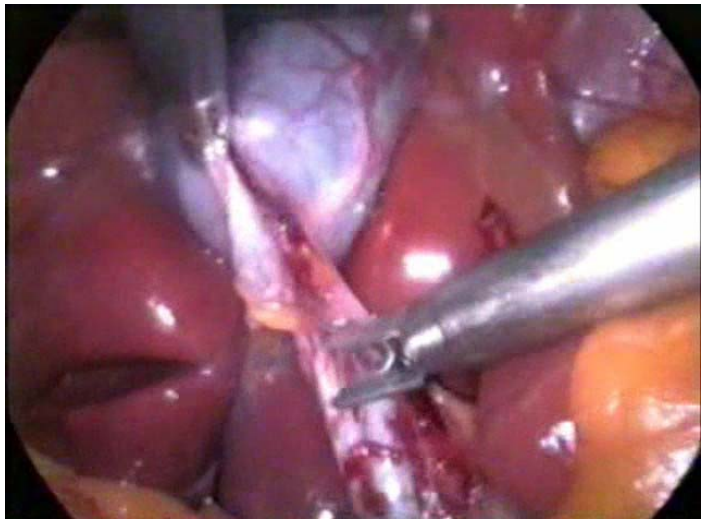
6.1.1.11: Adhesiolysis near cystic

6.1.1.12: View of the dissected cystic

6.1.1.9: Exploration of the cystic duct

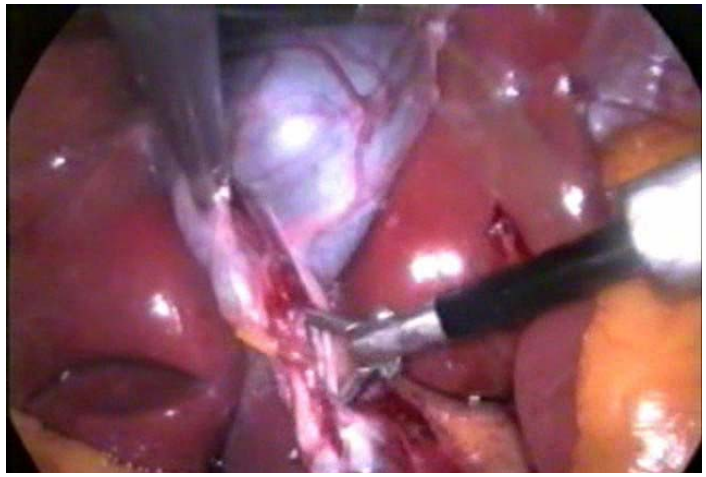


6.1.1.10: View of the cystic duct



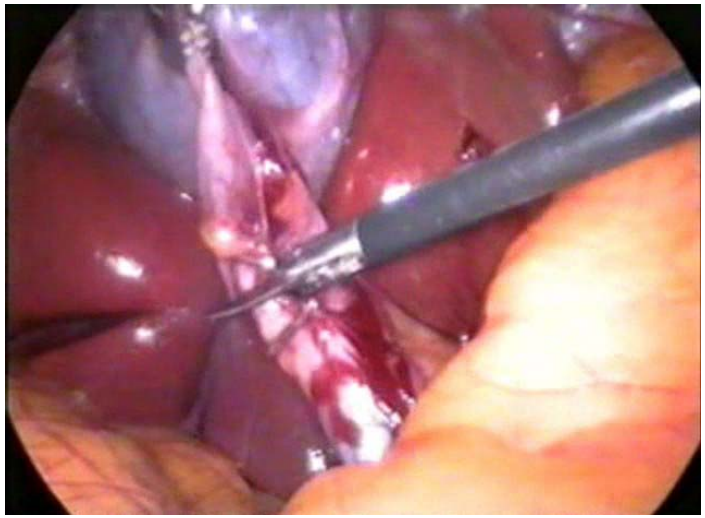
6.1.1.15: Clipping the cystic duct

6.1.1.16: Clipper on the cystic duct for proximal clipping



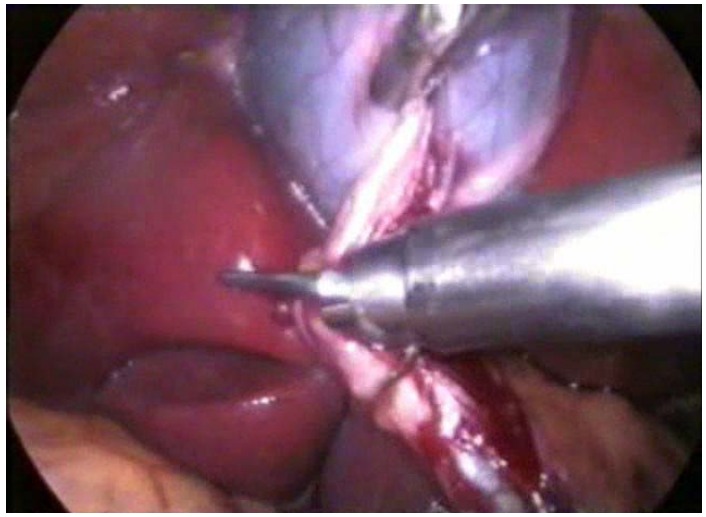
6.1.1.13: Dissecting the cystic duct

6.1.1.14: Clipper is in



6.1.1.19: Cutting of the cystic duct between proximal and distal clips

6.1.1.20: Showing cut ends of the cystic duct



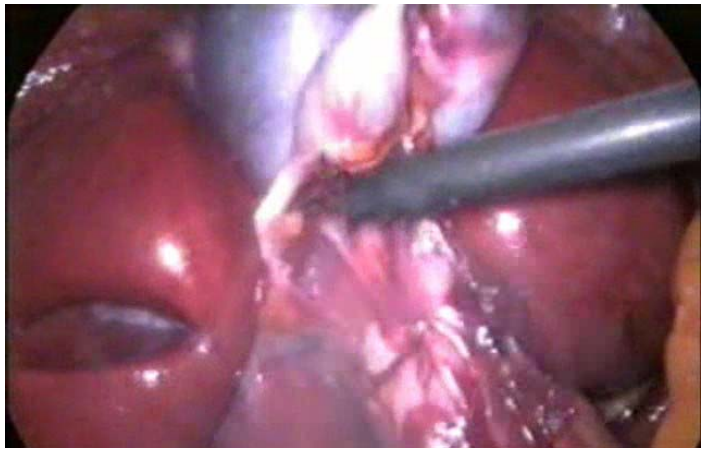
6.1.1.17: Clipper on the cystic duct for distal clipping

6.1.1.18: Scissors is in

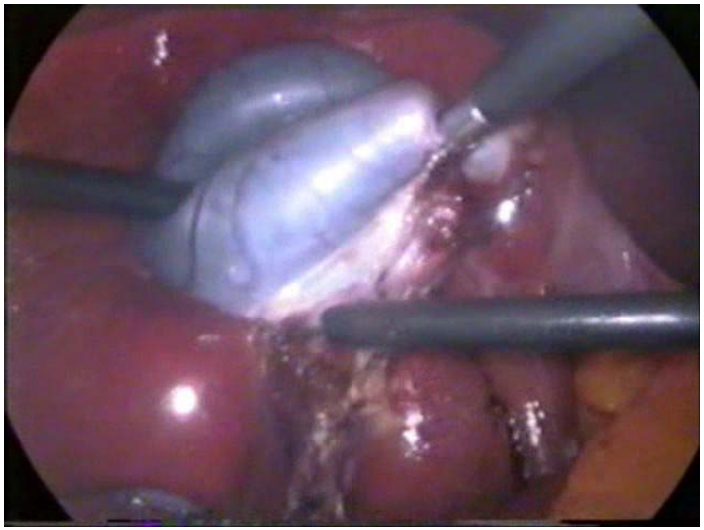
6.1.1.21: Diathermy hook is in

6.1.1.22: Fine dissection of the cystic artery by the hook

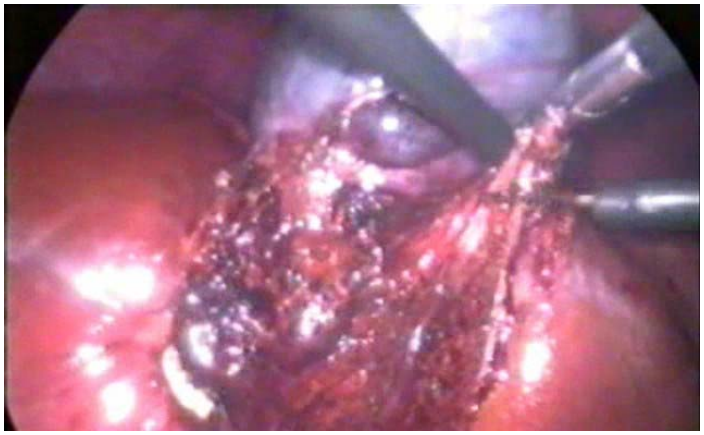
6.1.1.23: Control of the artery by clipping or by coagulation and cutting



6.1.1.24: Cauterization of the artery in 2cm apart points then cutting in between



6.1.1.27: Removing the gallbladder from its bed by the hook from right



6.1.1.28: Removing the gallbladder from its bed by the hook from left

6.1.1.25: Cut ends of the artery

6.1.1.26: Start of removing the gallbladder from its bed by the

6.1.1.29: Removing the gallbladder from its bed by the hook

6.1.1.30: End of removing the gallbladder from its bed by the

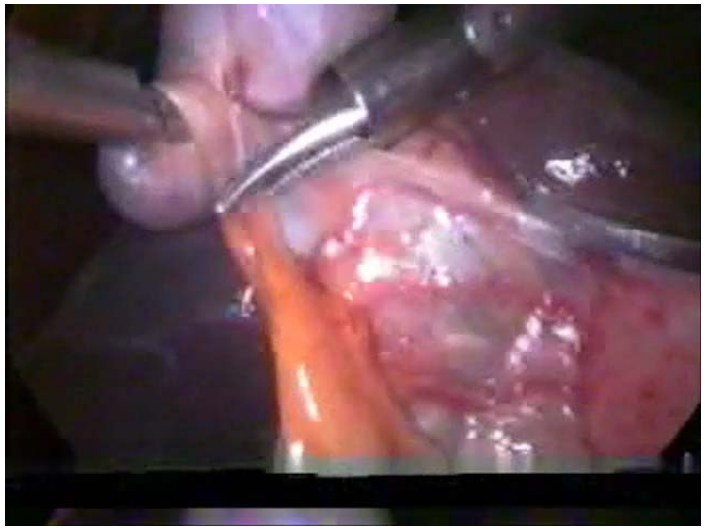
6.1.1.31: Free gallbladder

6.1.1.32: Free gallbladder put on the liver

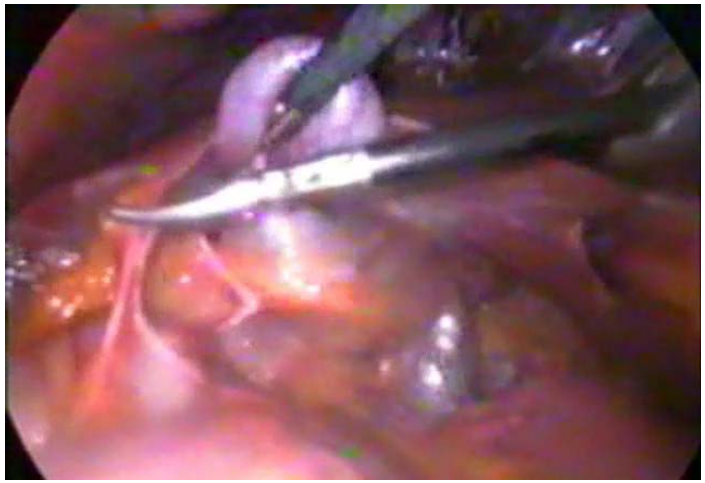
6.1.1.35: Gall bladder pulled out of the abdomen

6.1.1.33: Extraction of the gallbladder, grasping cut cystic

6.1.1.34: Extraction of the gallbladder via 10mm trocar

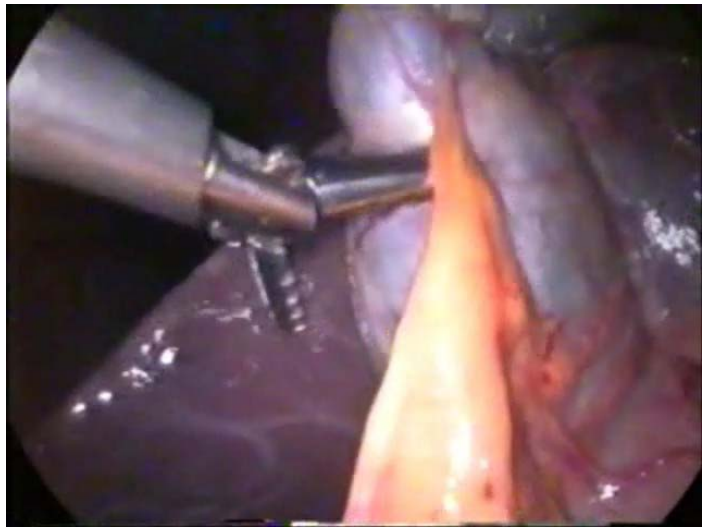


6.1.2.2: Catch and remove the adherent omentum or fibrous band as near as possible to the gallbladder

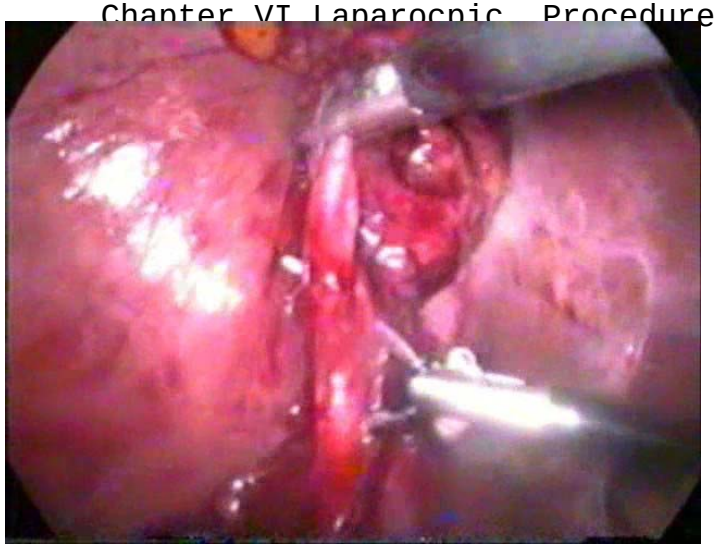


6.1.2: Adhesions during laparoscopy

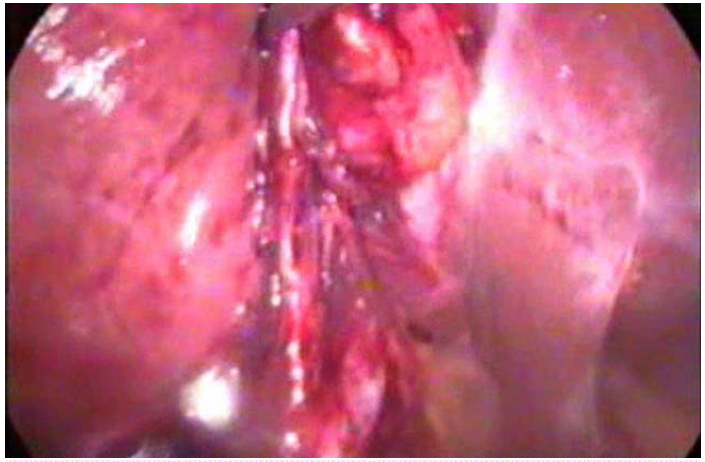
Some time from previous operations or from chronic cholecystitis we will face different degrees of adhesions in the field, or of gallbladder to the surrounding which need patient and delicate dissection and adhesiolysis to make the field optimal for procedure



6.1.2.1: The fundamental principle is to catch and remove the adherent omentum or fibrous band as near as possible to the gallbladder

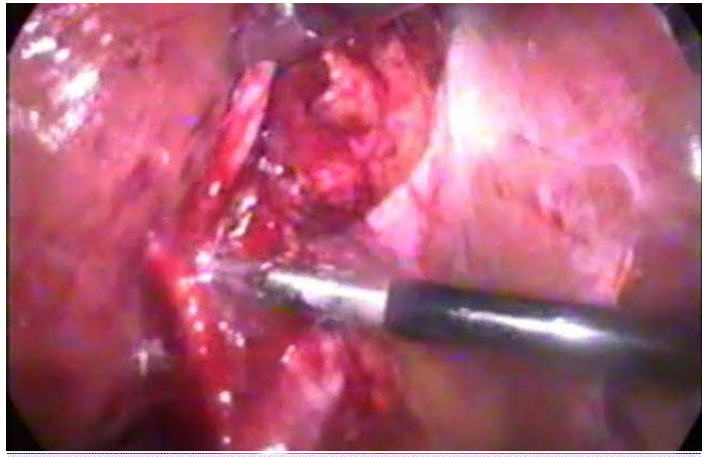


6.1.2.5: Dissecting cystic duct



6.1.2.6: Callot triangle after adhesiolysis

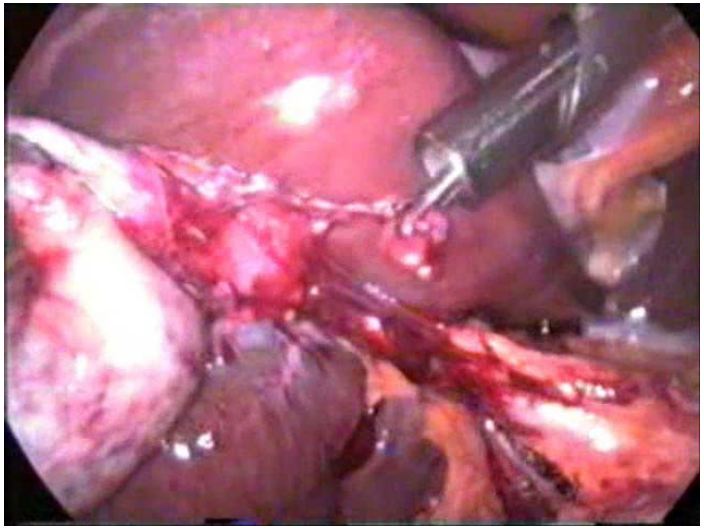
6.1.2.3: Continue the dissection in same manner



6.1.2.4: Adhesiolysis near cystic

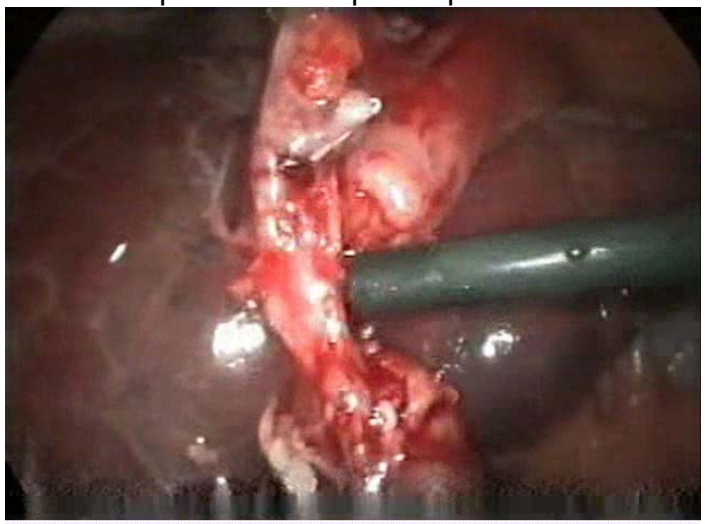
6.1.3: LAPAROSCOPY For Acute Cholecystitis

* Under general anesthesia, the patient is placed in a supine position. Abdominal access and pneumoperitoneum are achieved using an open Hasson approach below the umbilicus.
* Pneumoperitoneum maintained with carbon dioxide gas at a pressure of 10 mmHg during the surgery.
* Three additional trocars are inserted in the upper abdomen. The cystic duct and artery are ligated using metalic or absorbable clips.
* Intraoperative cholangiography must perform in selected patients in preoperative examination.
* Such as drip infusion cholangiography or magnetic resonance cholangiography, could not detect the bile duct clearly.
* After the gallbladder was freed by dissection, the specimen is extracted using a retrieval bag through the umbilical wound.
* A Penrose drain may be placed at the liver bed and the abdominal wall sutured.
* The operative times, intraoperative blood loss, intraoperative complications, rates of conversion to



6.1.2.7: Lymph node excised, usually it is near the cystic artery

6.1.2.8: Cystic artery after adhesiolysis



6.1.3.2: Dissection of the cystic artery after adhesiolysis

6.1.3.3: Haemostasis of the bed of gallbladder by coagulation

open surgery and reoperation, hospital stay and morbidity and mortality are more in comparison to elective cholecystectomy.

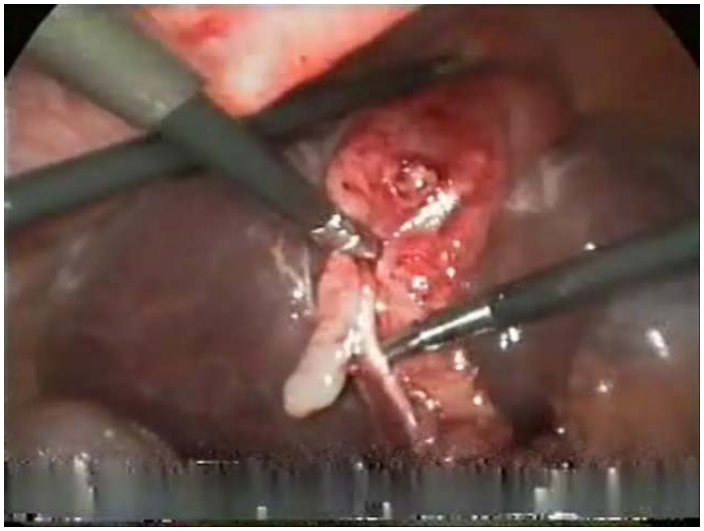
* The intraoperative blood loss determined by weighing the aspirated blood and blood-soaked gauze.

Following groups are suitable for day case surgery

Criteria for day-only admission
Live within 30 min drive from hospital
Access to private transport
Responsible adult with patient for 24 h postoperatively
American Society of Anesthesiologists classification of 3 or less
Attendance at a preadmission clinic

6.1.3.1: Adhesiolysis

6.1.3.6: For infected tissue and in case of suspected carcinoma tissue retrieval bag should be use



6.1.3.4: Lymph Node on the cystic artery

6.1.3.5: Peeling of gallbladder from its bed is easy

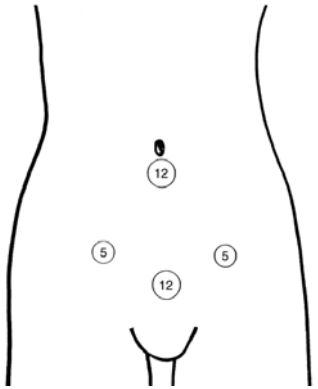
6.2: LAPAROSCOPIC APPENDECTOMY

The principles behind laparoscopic appendectomies are similar to those for other laparoscopic procedures

All patients should have an indwelling urinary catheter and nasogastric tube inserted prior to trocar insertion.

The surgeon frequently stands to the patient's left with the video monitor at the foot of the table, or to the patient's right.

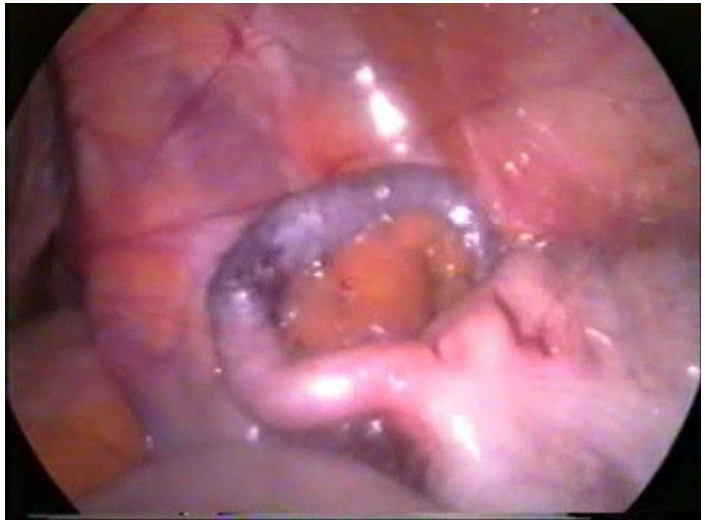
Pneumoperitoneum is established and a 10-mm trocar cannula is inserted through the umbilicus.



6.2.1: Showing Sites of the trocars in lower abdominal laparoscopy

LAPAROSCOPIC APPENDECTOMY

6.2.3: Showing Caecum and catarrhal appendicitis



6.2.4: Showing gangrenous appendicitis

A 10-mm forward-viewing laparoscope is placed through the cannula and the peritoneal cavity is inspected.

Next, a 10-mm trochar is introduced into the suprapubic region in the midline and additional 5-mm ports placed in either the right upper or lower quadrant.

Exposure is facilitated by placing the patient in the Trendelenburg position, right side up. Generally the cecum is easily visualized and the appendix easily identified.

6.2.2: Showing Caecum and suppurative appendicitis

The mesoappendix is divided with a stapling device or by using electrocautery for dissection and clips or a ligating loop to secure the appendiceal artery.

Gentle traction can be applied to the mesoappendix by retracting the tip of the appendix with an atraumatic grasper placed through the right upper quadrant trocar.

6.2.5: Showing Cecum and catarrhal appendicitis

6.2.6: Grasping mesoappendix

6.2.7: Showing Cauterization of the marginal appendicular artery

6.2.7: Clipping of the appendix near the base

6.2.8: Second clip on the appendix

6.2.9: The appendix is divided with scissors or electrocauterization. Invagination of the appendiceal stump is not routinely performed.

6.2.12: Cutting the rest of the endo-ligature

6.2.13: Freed appendix

6.2.10: Second option to ligate the appendix with endoloop

6.2.11: Secure the knot with the Knot tier of the endoloop

6.2.14: Grasping the cut (Proximal) end of the appendix

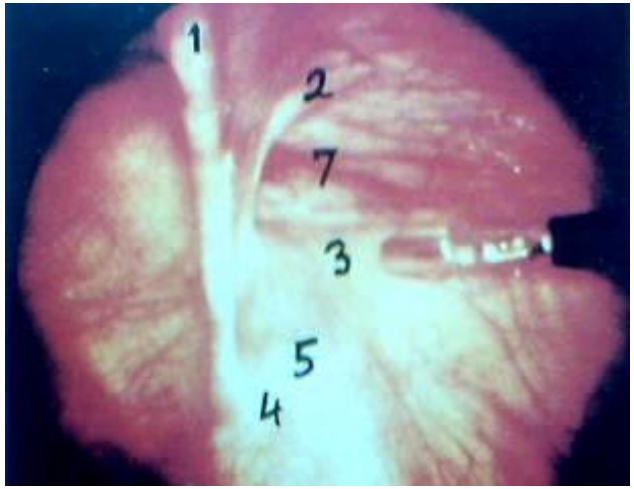
6.2.15: Removal of the appendix via umbilical trocar

6.3.1: Inguinal Hernia

6.3: Hernia Repair

and left 2-3cm below ad medial to anterior superior iliac spine.

* Try to find following anatomical landmarks



6.3.1.1.1:

1. Medial umbilical ligament,
2. Inferior Epigastric vessels,
3. Spermatic vessels,
4. Vas deferens,
5. External iliac vessels in “Triangle of Doom”, Dissection should be avoided in the "triangle of doom" which is bounded medially by the vas deferens and laterally by the gonadal vessels.
6. Indirect defect

6.3.1.1.Transabdominal preperitoneal mesh repair (TAPP)

* Total extraperitoneal repair (TEP)

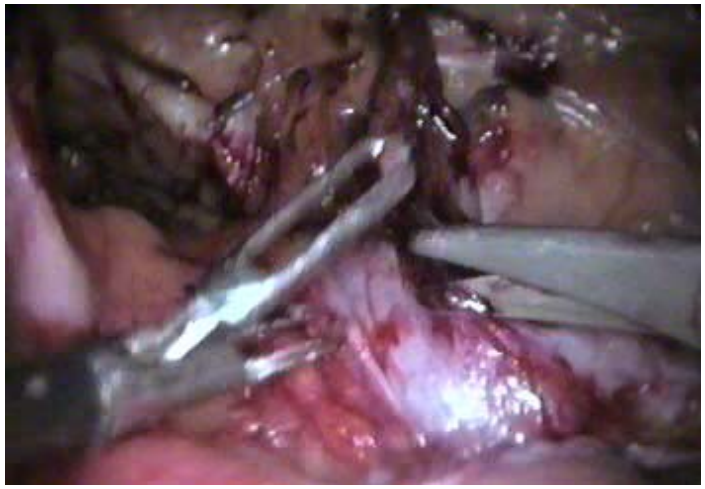
- The general anesthesia and the pneumoperitoneum required as part of the laparoscopic procedure do increase the risk in certain groups of patients.
- The laparoscopic hernia repair may also be more difficult in patients who have had previous lower abdominal surgery.
- The elderly may also be at increased risk for complications with general anaesthesia combined with pneumoperitoneum.

Trans-abdominal Pre-peritoneal repair of Inguinal Hernia

* After general anesthesia, putting nasogastric tube and Foley’s catheter, the patient put in supine position, by putting the table head 15 degree down. Pneumoperitoneum created in usual way

* Periumblical port 1cm long, create for the telescope,later two incisions 5mm long done on right

Epigastric vessels should be safe guarded



6.3.1.1.3: Dissection should be started with opening the peritoneum lateral to the medial umbilical fold in order to identify Cooper's ligament. Dissect the spermatic cord from the peritoneum by separating the elements of the spermatic cord from the peritoneum and peritoneal sac

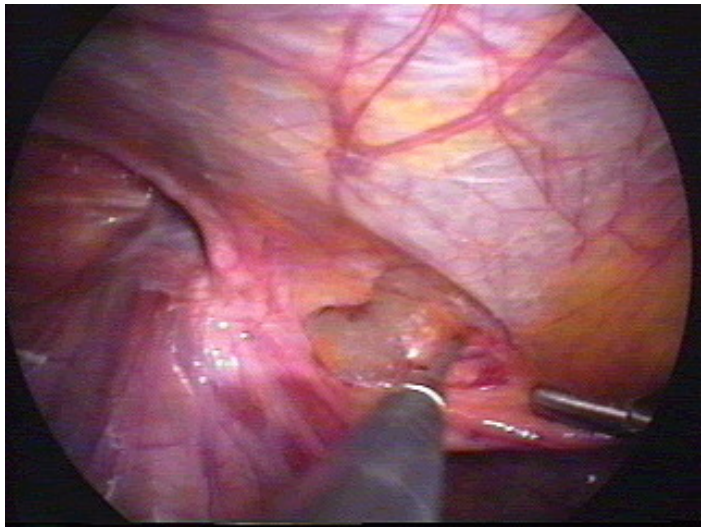
The important landmarks of laparoscopic hernia repair are the pubic bone and inferior eipgastric vessels.

Dissection of the pre-peritoneal space

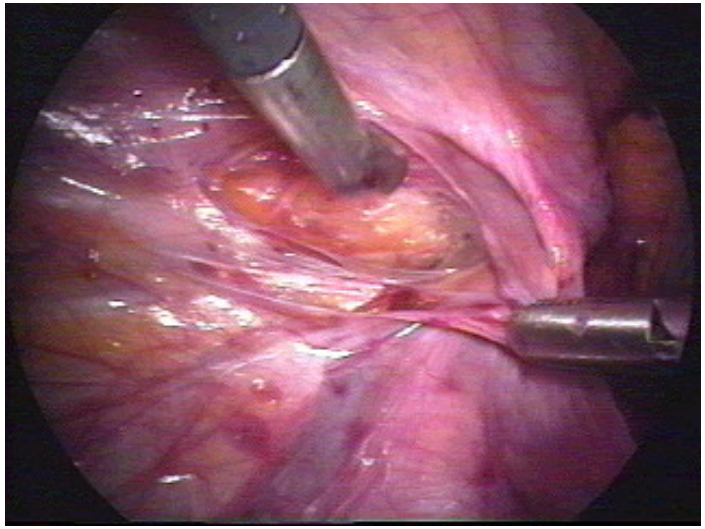
Incision begins just above and 4 cm lateral to the outer margin of the deep ring

peritoneum incised medially almost up to the midline

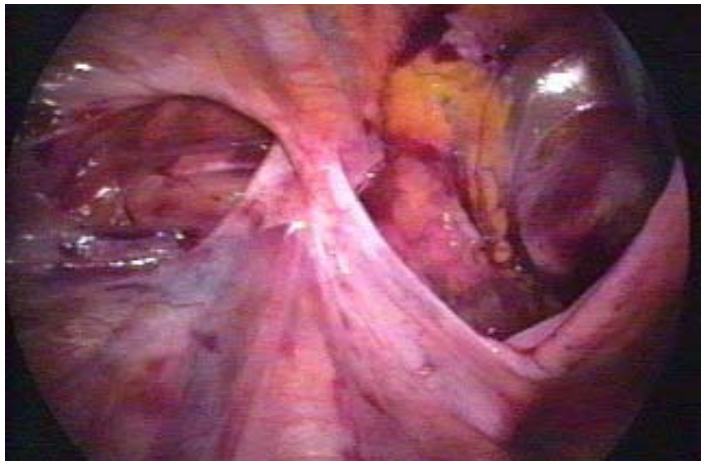
1. Dissect the peritoneal flap towards the iliac vessels inferiorly and towards anterior abdominal wall superiorly.
2. Cooper's ligament, arch of transverses abdominus, conjoint tendon and Iliopubic tract should be seen.
3. Separate the elements of the spermatic cord from the peritoneal sac.



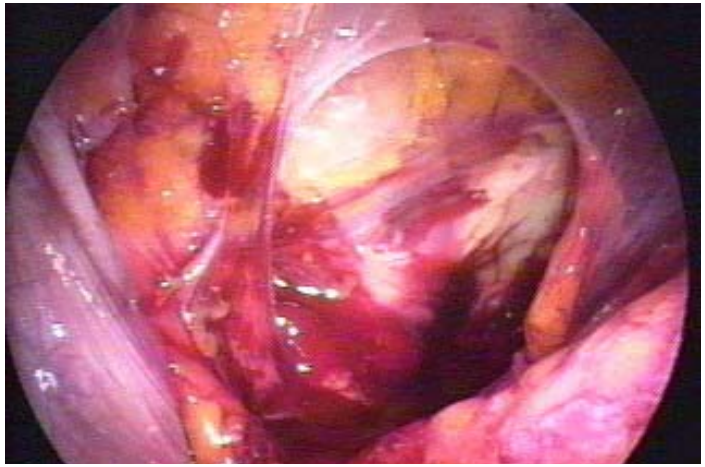
6.3.1.1.2: Dissection of pre peritoneal space



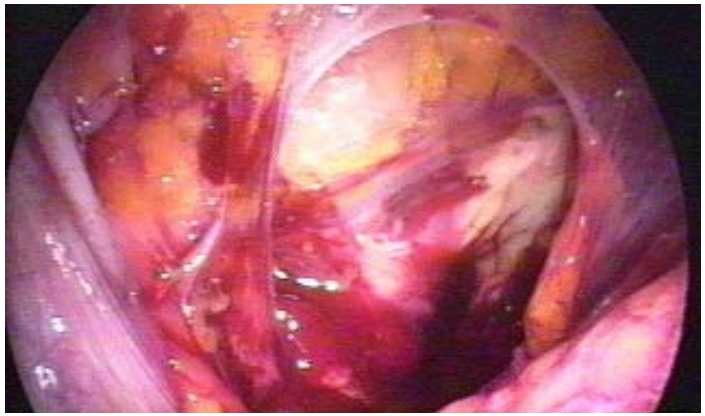
6.3.1.1.6: The ileopubic tract lateral to the internal ring is exposed.



6.3.1.1.7: The dissection is complete .the sac left in place



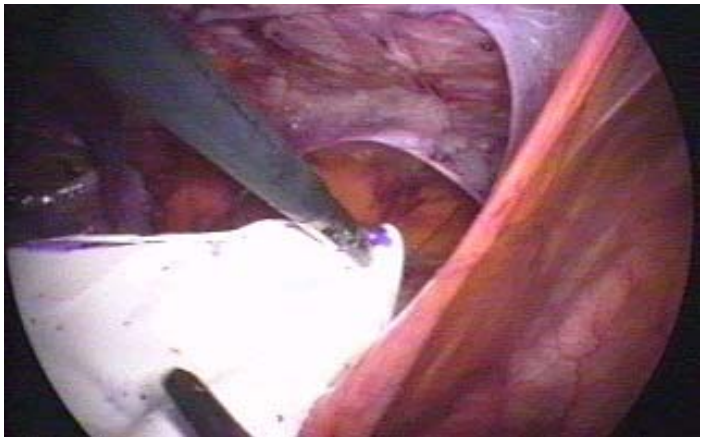
6.3.1.1.4: Dissection starts with opening the peritoneum lateral to the medial umbilical fold in order to identify Cooper's ligament



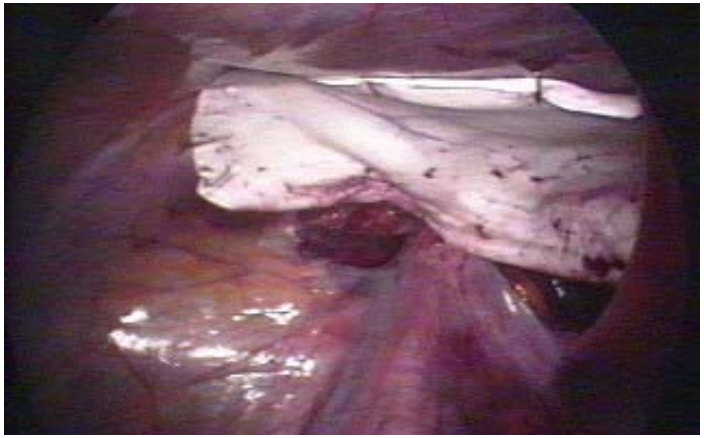
6.3.1.1.5: Cooper's ligament has been exposed from the pubic tubercle down to the femoral vessels and vas deference

6.3.1.1.10: Peritoneum flap is replaced over the mesh and it is closed either by staple or suture

With stapling the mesh ,intraabdominal co2 pressure must be reduced to 9mm Hg

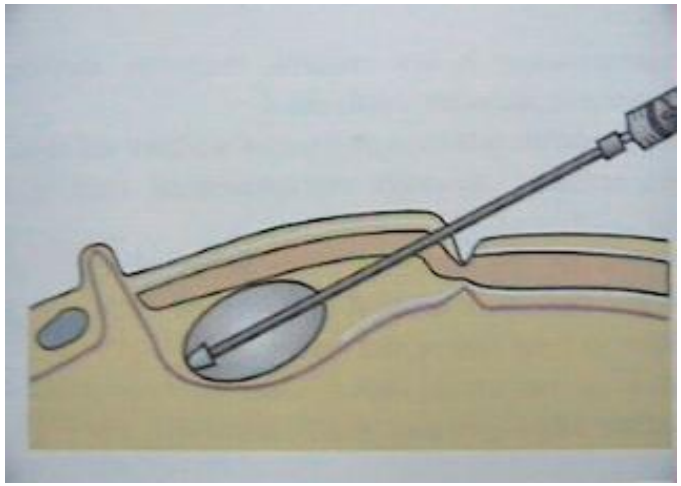


6.3.1.1.8: An 8 by 12cm mesh patch inserted.



6.3.1.1.9: Put on the defect and sutured in place by stapler

A balloon dissector should be introduced with telescope and balloon is inflated for further dissection of the pre-peritoneal space.



6.3.1.2.2: Balloon dilatation is helpful in TE

Insert two additional ports on one 5mm trocar on the midline at a midway distance between the umbilicus and symphysis pubis and another 10-12 mm Trocar below and medial to the right anterior iliac spine.

Dissection of preperitoneal space and cord structures in TEP.

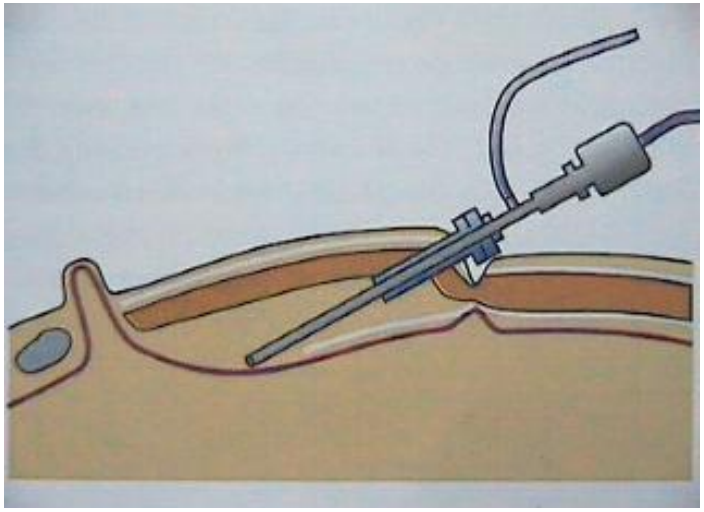
I n totally extraperitoneal repair of hernia dissect the spermatic cord from the peritoneum by separating

6.3.1.2: Total extraperitoneal repair (TEP)

Approach to preperitoneal space.

Insertion of trocar

An 11mm port is introduced without its sharp tip with a laparoscope in an angle of about 30 degree. A small pre peritoneal pocket is created by manipulating laparoscope in sweeping manner.



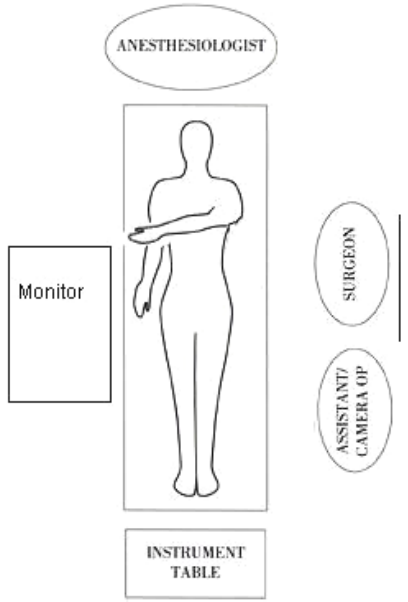
6.3.1.2.1: Sweeping movement of telescope

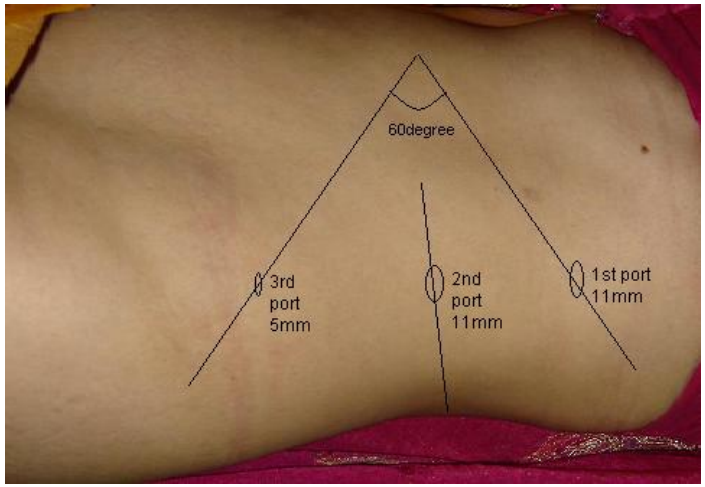
the elements of the spermatic cord from the peritoneum and peritoneal sac.

Dissection should be continued until the peritoneum has reached the iliac vessels inferiorly. Mesh in appropriate size usually 15X15 Cm is used.

Mesh should be rolled and load backward in one of the port. Mesh should be fixed by stapling first in its middle part three finger above the superior limit of the internal ring.

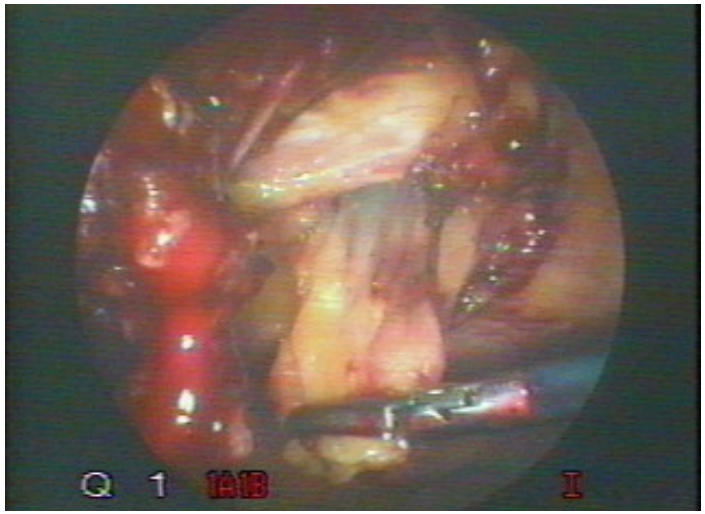
In totally extraperitoneal repair we do not need much staple because peritoneum in not breached and once the gas from pre-peritoneal space is removed it will place the mesh in its proper position.





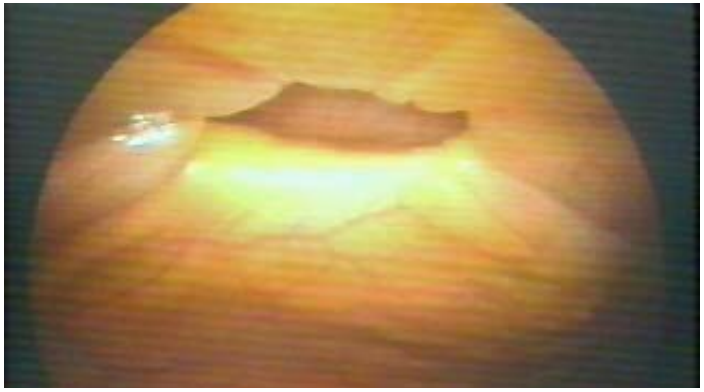
6.3.2.1: Site of the ports and direction of the trocars

6.3.2:Ventral Hernia

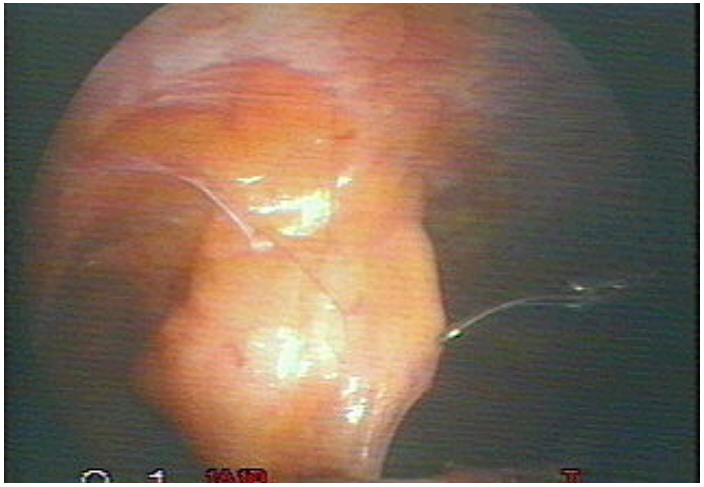


6.3.2.4The sac is now being excised

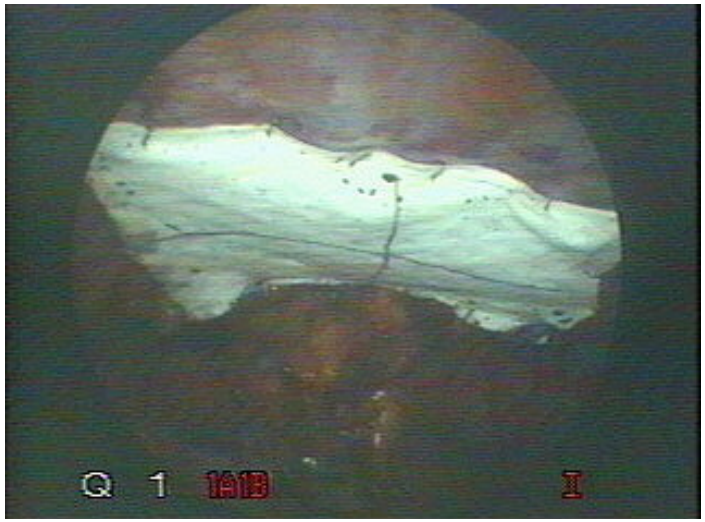
6.3.2.5: The hernia sac is being inserted into a pleatman sac for removal



6.3.2.2: Showing laparoscopic view of a ventral hernia just to the left of the midline



6.3.2.3: The sac is now being everted for excision.



6.3.2.8: The completed repair is shown

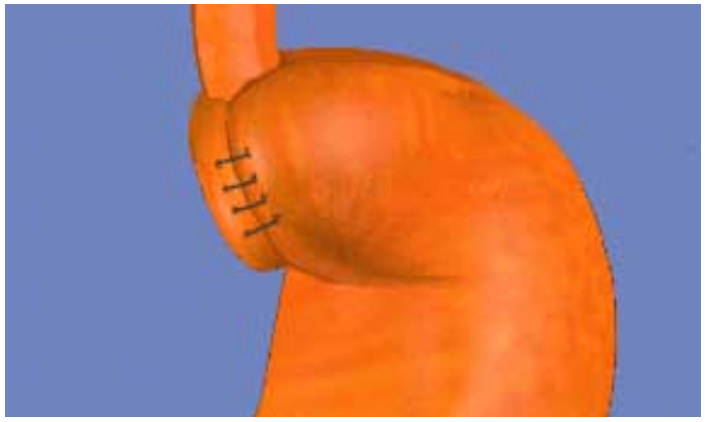
Recently a technique of using proline suture to fix the mesh with anterior abdominal wall is used with the help of suture passer or looping technique with the help of Veress needles canulla. The main idea of this method is to reduce the cost of surgery, but there is increased chance of infection and adhesion with this method. We also lack any long term randomized controlled trial to prove the outcome of this external suture technique to fix the mesh in ventral hernia repair.

6.3.2.6: A Gore-Tex dual-mesh patch measuring 8 by 12 cm. in size is taken and prepared by tying sutures to all four corners

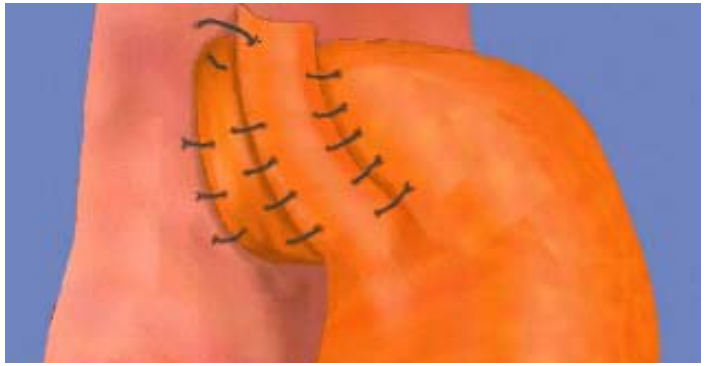
6.3.2.7: A hernia stapler is then used to secure the patch sides to the fascia.

Types of Fundoplication

The 360 degrees Nissen fundoplication (NF) has been the standard operation for Gastro Esophageal Reflux, but is associated with substantial rates of, "gas bloat," gagging and dysphasia



6.4.1: 360 degree Nissen Fundoplication

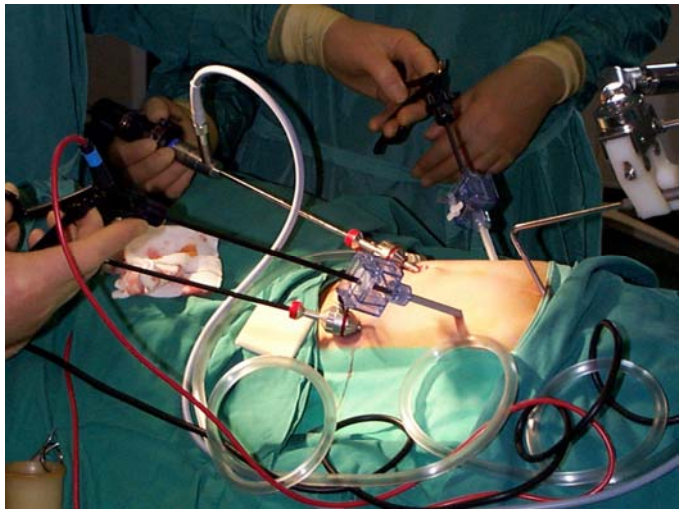


6.4.2: 270 degree Toupet Fundoplication

6.4: FUNDPLICATION

4. Nathanson liver retractor is inserted through a 5 mm incision in the midline, extending from skin to the peritoneal cavity,

5. A 5 mm port is positioned in the left mid clavicular line immediately below the costal margin. This port is mainly used for a forceps which will hold the tape encircling the oesophagus



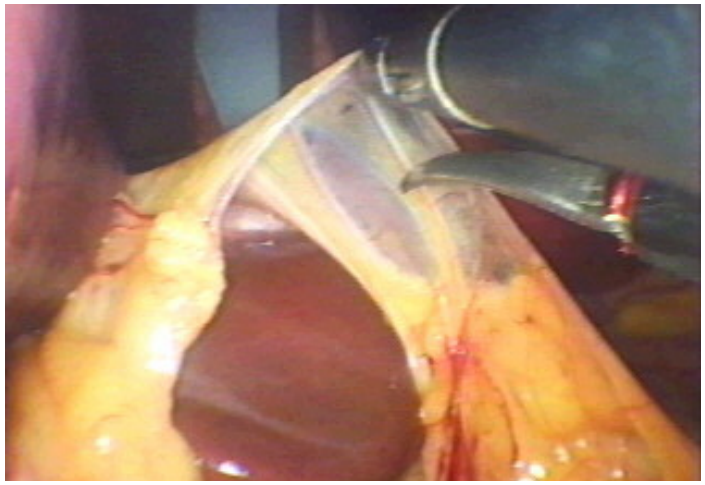
6.4.3: Formal diagnostic laparoscopy performed,

To make the procedure easy first we try to show you some pictures, showing main steps of the procedure, and then we will see the steps in real images

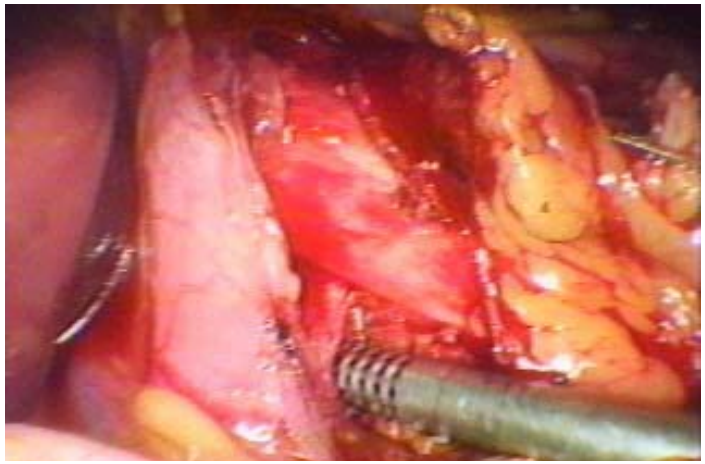
Although Nissen total fundoplication is the most commonly performed procedure, partial fundoplication, either anterior or posterior, is becoming more acceptable because of lower risk of long term complication. The 360 degrees Nissen fundoplication (NF) has been the standard operation for Gastro Esophageal Reflux (GER), but is associated with substantial rates of recurrence, "gas bloat," gagging, and dysphagia. most surgeon believe that the Toupet fundoplication (TF), a 270 degrees posterior wrap originally described in conjunction with myotomy for achalasia, has fewer complications, and its long-term outcome in compared with Nissen Fundoplication is favorable both in children as well as adults.

PROCEDURE: Under general anesthesia, The patient is placed on the operating table with the legs in stirrups, the knees slightly bent and the hips flexed approximately 10°. The operating table is tilted head up by approximately 15 degree pneumoperitoneum created, ports inserted:

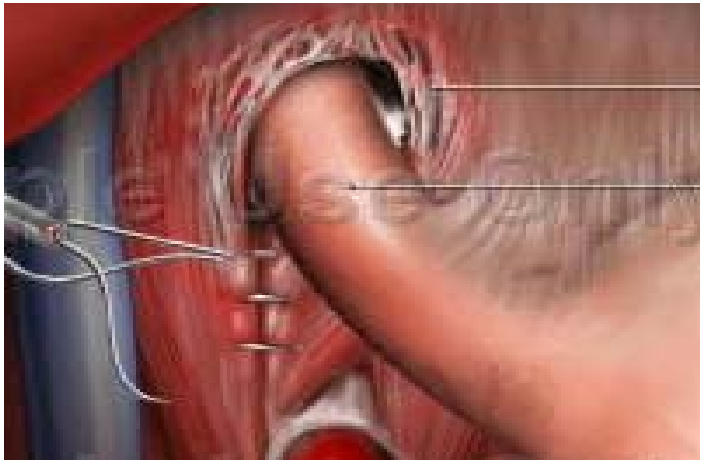
1. A 10mm camera port 5cm above the umbilicus.
2. A 5mm port in the right upper quadrant.
3. A port, with a variable 5-10 mm is in the left upper quadrant - a mirror image of the one on the patient’s right.



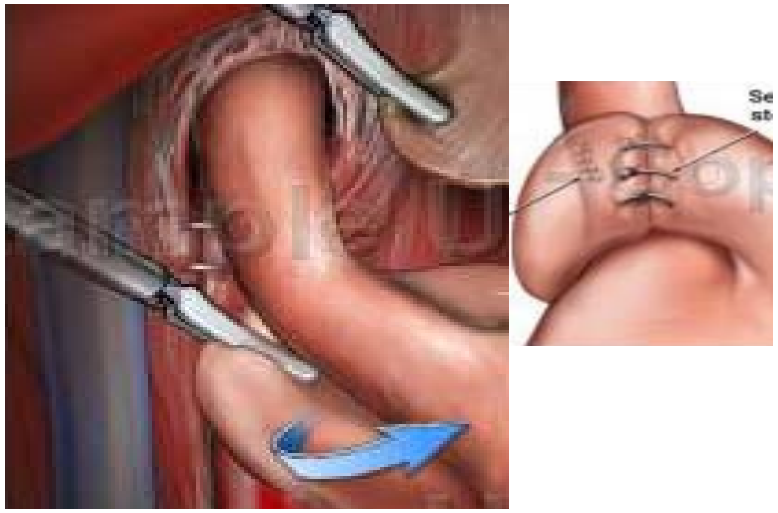
6.4.6: The operation starts by dividing the gastrohepatic and phrenoesophageal ligaments exposing the GE junction



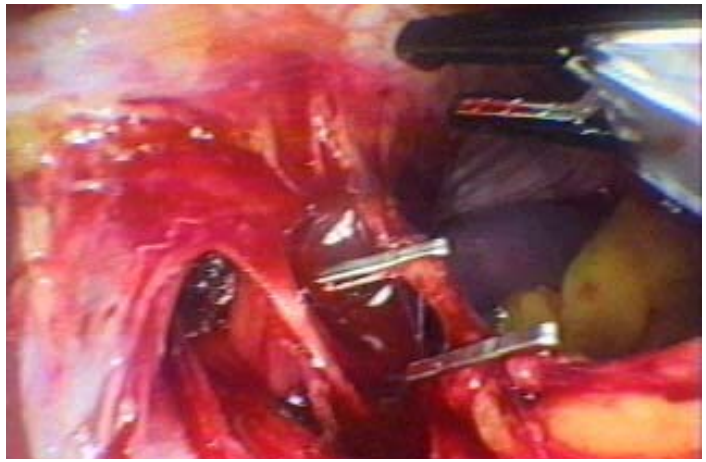
6.4.7: The right crura have been dissected free, & the esophagus is being recognized.



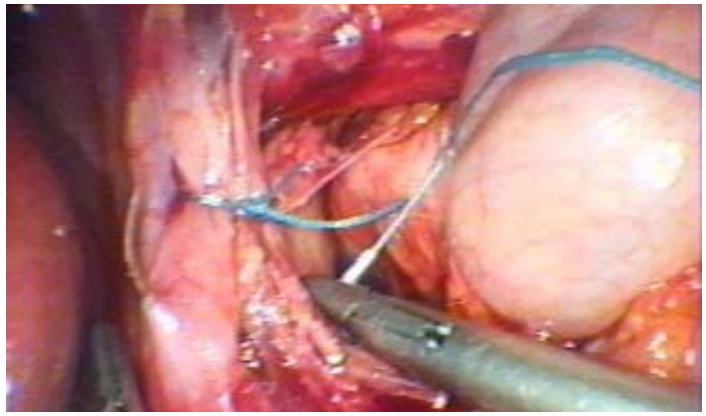
6.4.4: Suturing of the cruras



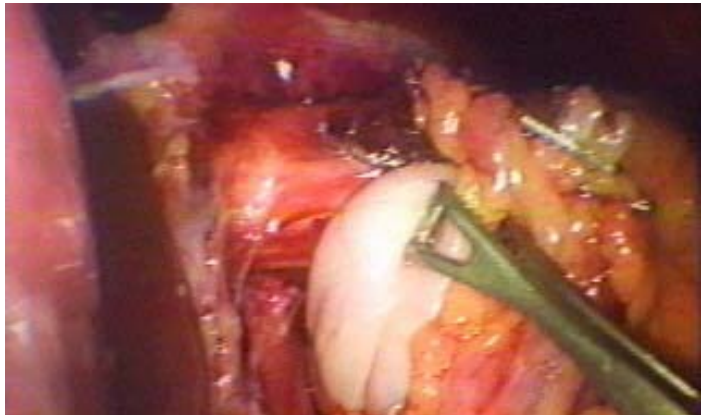
6.4.5: Wrapping of the esophagus with fundus and suturing of the fundal folds anterior to the esophagus



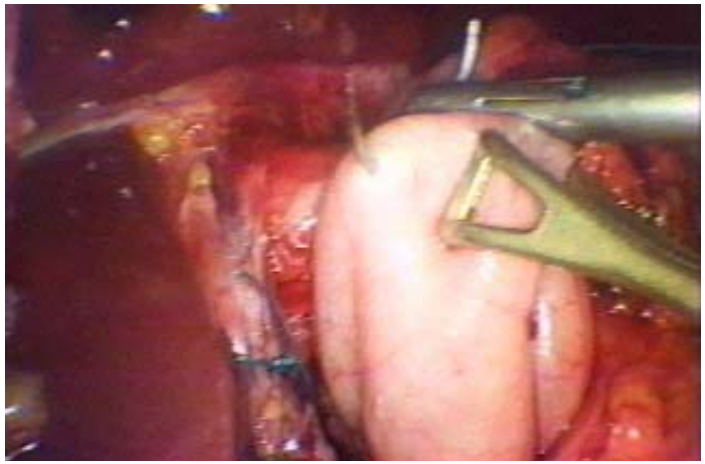
6.4.8: An arterial vessel is being divided between clips to allow better mobilization of the stomach



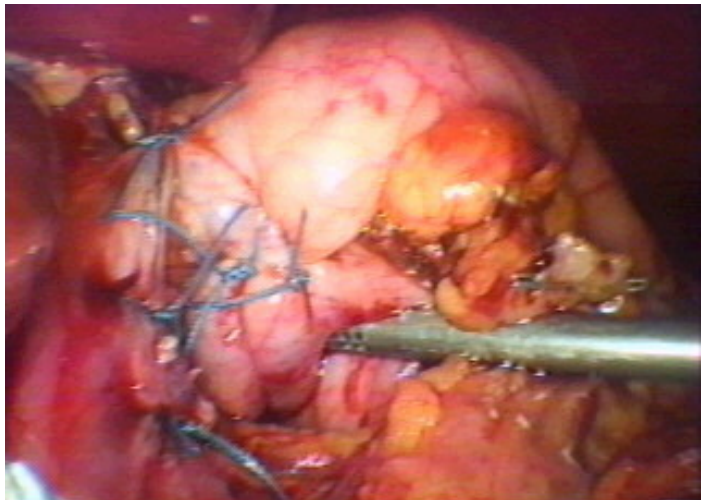
6.4.9: The right and left cruras are sutured with interrupted stitches to reduce the hiatus.



6.4.10: The stomach is grasped from behind the esophagus, to obtain a 360 degree "stomach-wrap" around the esophagus

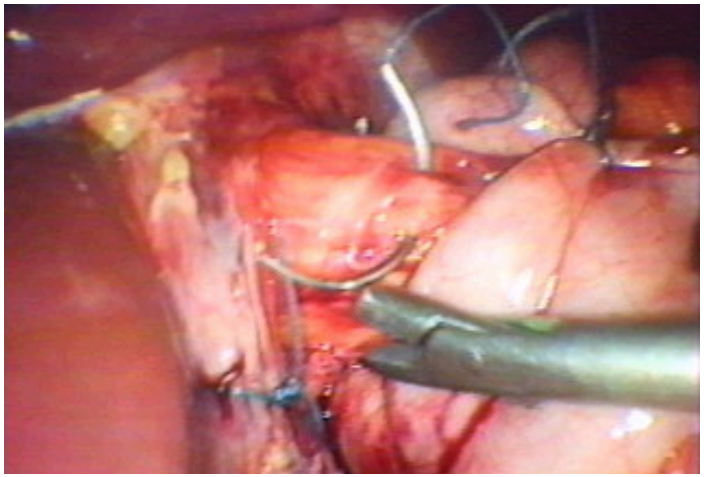


6.4.11: Number "0" Ethibond stitch is placed between both gastric flaps.

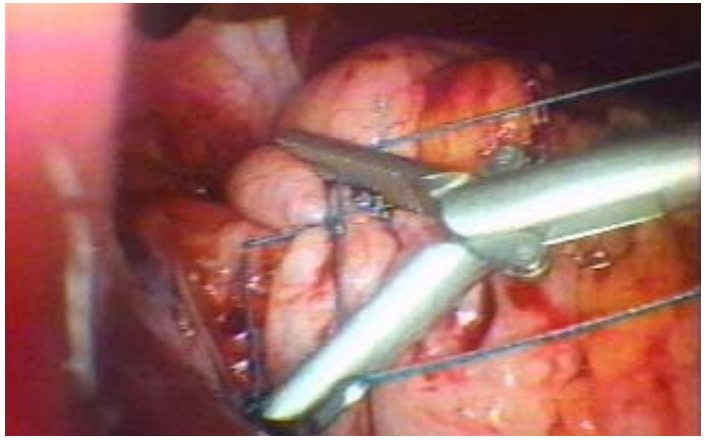


6.4.14: Number "0" Ethibond stitch is placed between both gastric flaps.

Postoperatively a chest X-ray is obtained in the recovery room to exclude a pneumothorax. Patients are begun on clear liquids on the day of surgery and soft diet the following day. Average length of stay is 2 days. Intraoperative complications may include injury to visceral organs, bleeding, pneumothorax and vagal injury. Postoperative complications include wrap slippage,



6.4.12: The Nissen wrap is anchored to the esophagus to avoid



6.4.13: Stitches are tied off in an extra corporeal fashion using the "Knot Tier

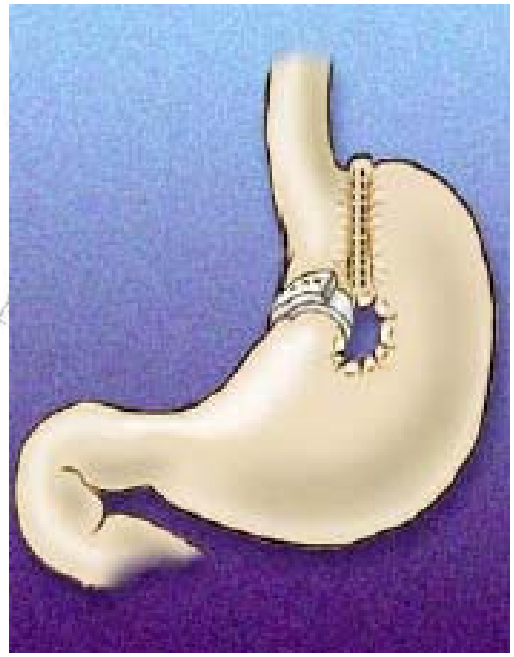
Types of Operations for morbid obesity;

I. Gastric restrictive procedures
*Lap. Vertical banded gastroplasty.
*Lap. Adjustable gastric Banding
II.Malabsorptive Procedure
*Biliopancreatic diversion + duodenal switch, jejuno-ileal Bypass
III.mixed procedure
*R – Y Gastrojejunostomy

6.5: LAPAROSCOPIC BARIATRIC SURGERY

6.5.1: Laparoscopic Vertical Banded Gastroplasty (VBG)

In this procedure the stomach is segmented along its vertical axis. To create a durable reinforced and rate-limiting stoma at the distal end of the pouch, a plug of stomach is removed and a propylene collar is placed through this hole and then stapled to itself. Because the normal flow of food is preserved, metabolic complications are rare

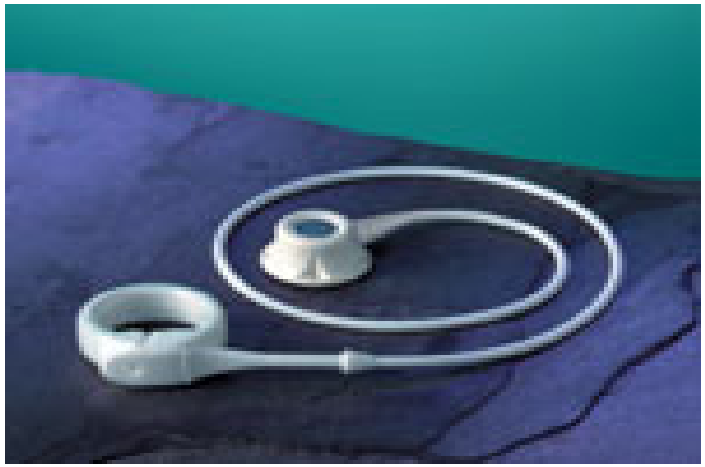


6.5.2: Adjustable Gastric Banding

- It is the least invasive surgical treatment of morbid obesity.
- Described in 1993 by *Catona* .
- It is purely restrictive procedure.
- In Europe, it is the bariatric procedure of choice.
- In U.S.A., FDA approval since June 2001.

-Techniques

Adjustable gastric banding involves placing a gastric band around the exterior of the stomach.



The band is attached to a reservoir that is implanted subcutaneously in the rectus sheath. Injecting the reservoir with saline alters the diameter of the gastric band; therefore, the rate limiting stoma in the stomach can be

6.5.2.3: Passing of the guide via the window from right to left

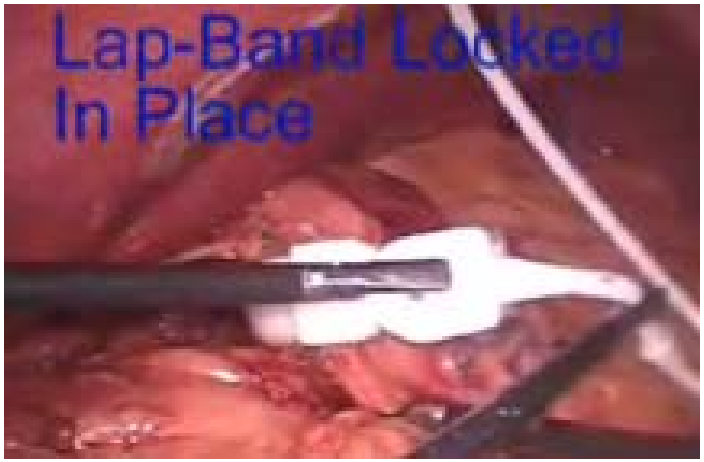
6.5.2.4: Putting the free end of the band on the guide

progressively narrowed to induce greater weight loss, or expanded if complications develop.

6.5.2.1: Making a window in hepatogastric ligament by harmonic

6.5.2.2: Continues

6.5.2.7: Engagement of the two ends of the band anteriorly

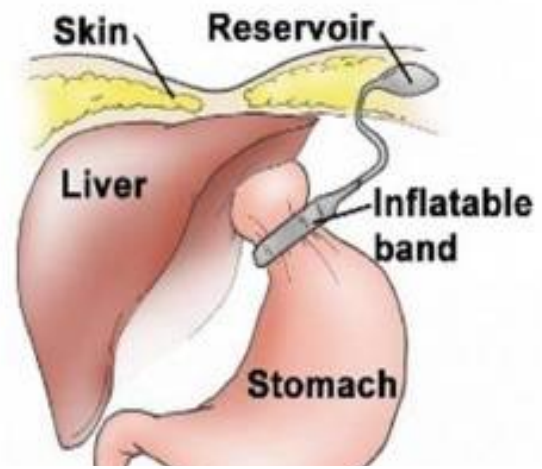


6.5.2.8: Lap band locked in place

6.5.2.5: Pulling the guide with the band from left to right behind the upper stomach

6.5.2.6: Continues

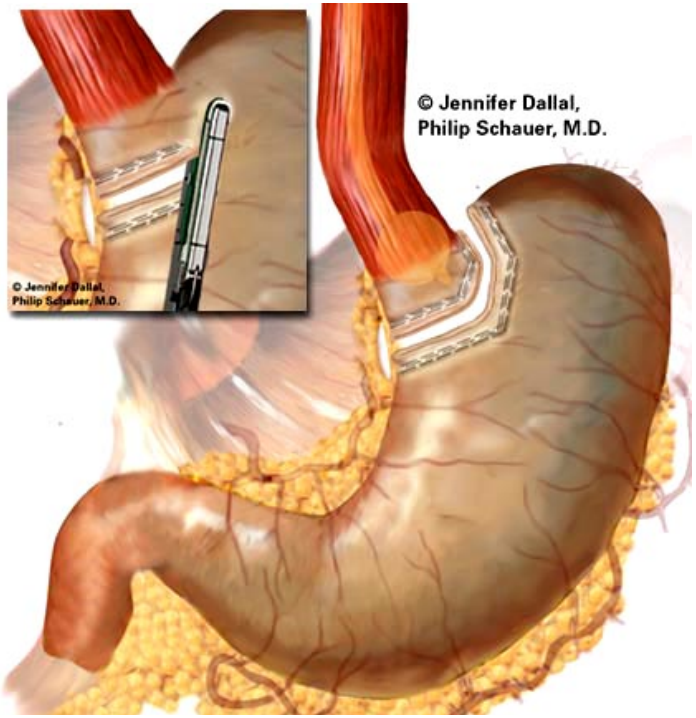
6.5.2.11: Taking the reservoir of the band to sub rectal space



6.5.2.12: Taking the reservoir of the band to sub rectal space

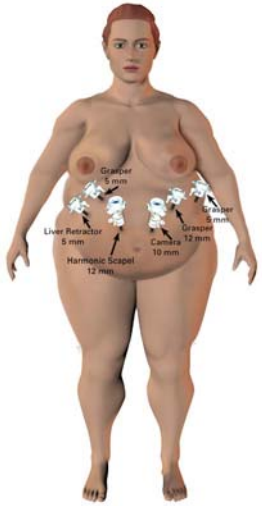
6.4.5.9: Approximation and suturing of the gastric fundus anterior to the band

6.5.2.10: Wrapping is in continuous

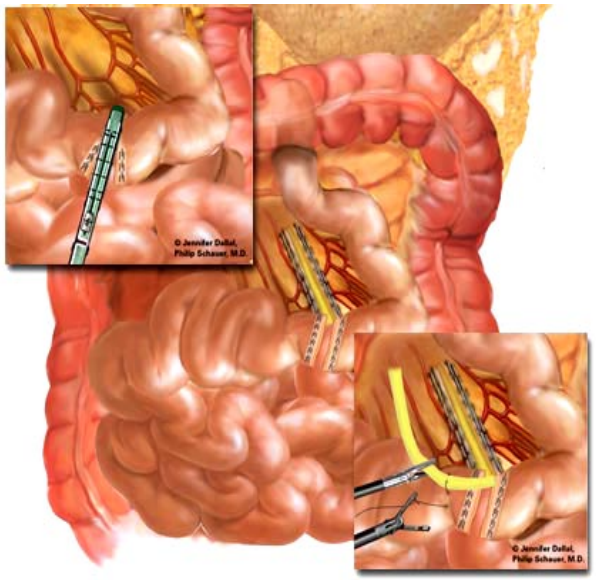


6.5.3.2: The stomach is sized to a small pouch by first identifying the esophago-gastric junction and then passing a Baker tube filled with 15 cc of saline solution. The Endo GIA stapler (US Surgical), 60 mm long with 4.8 mm staples is then fired three times

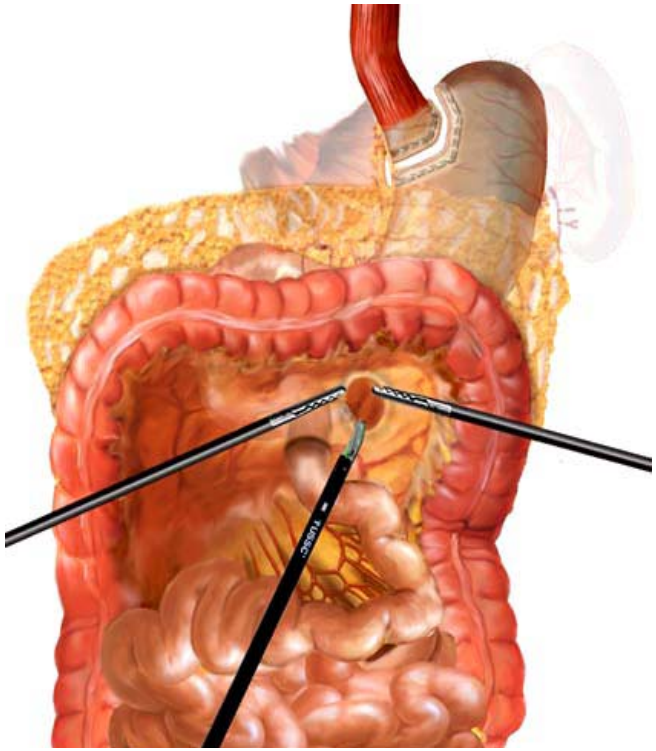
6.5.3 : Laparoscopic Roux-en-Y Gastric Bypass



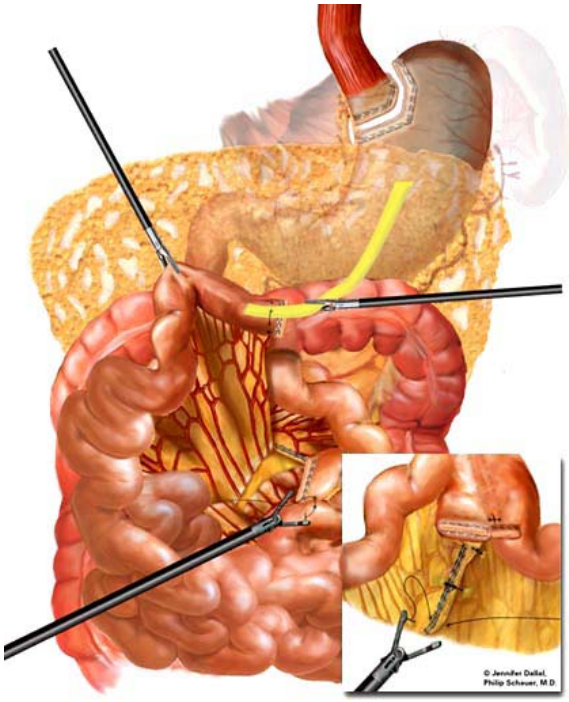
6.5.3.1: The patient is placed on the table and general anesthetics are administered. Trocars are placed as shown in this picture



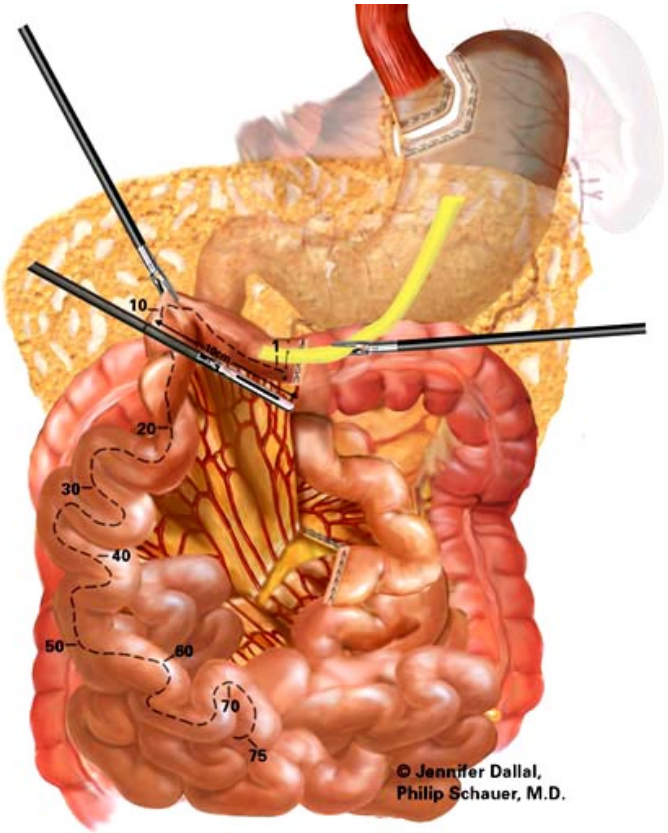
6.5.3.4: The jejunum is divided 15 cm beyond the ligament of Treitz ,by using an Endo GIA II stapler, 45 mm long with 3.5 mm staples. In addition the mesentery is also divided with a Endo GIA II stapler, but this time using the vascular load (45 mm length, 2.0 mm staples). A rubber drain is sutured to the jejunum to help with the pulling.



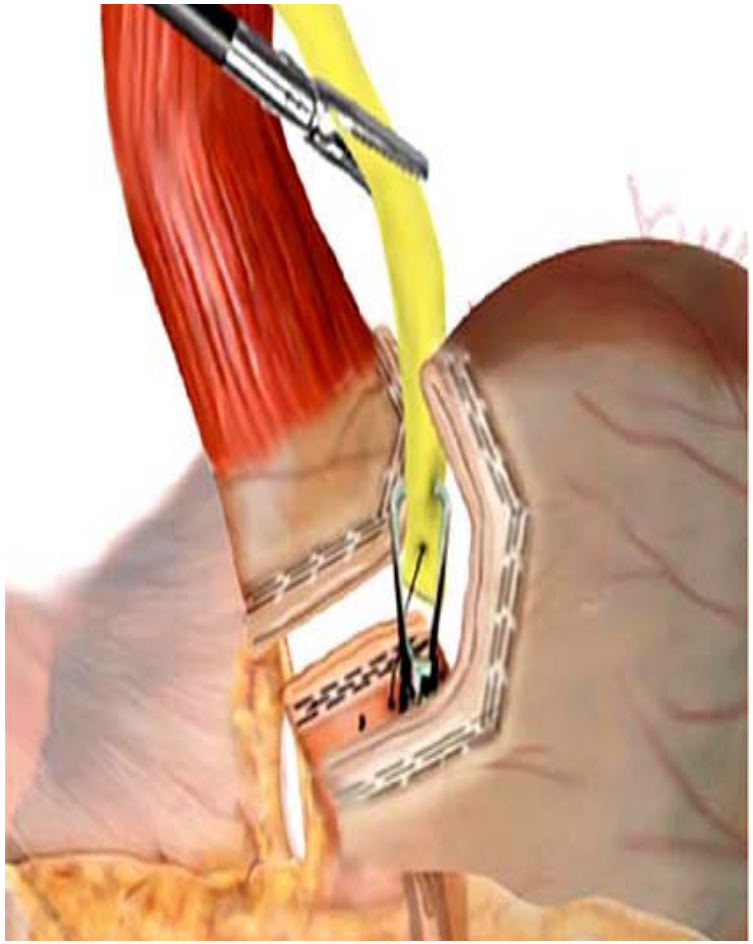
6.5.3.3: A retrogastric-retrocolic tunnel is performed in the mesocolon anterior and lateral to the ligament of Treitz. This "window" will facilitate the passage of the Roux-limb



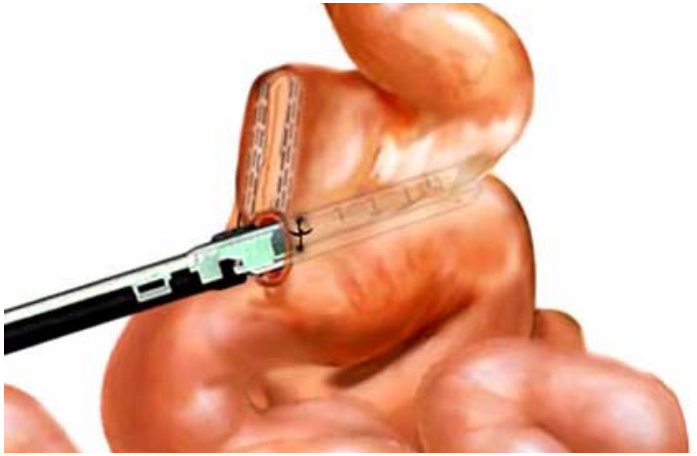
6.5.3.6: An end-to-side anastomosis between the proximal jejunum and the roux limb is created by firing two Endo GIA II staplers. The enterotomy is closed using another load of staples. The mesentery is also closed to prevent bowel entrapment (internal hernias).



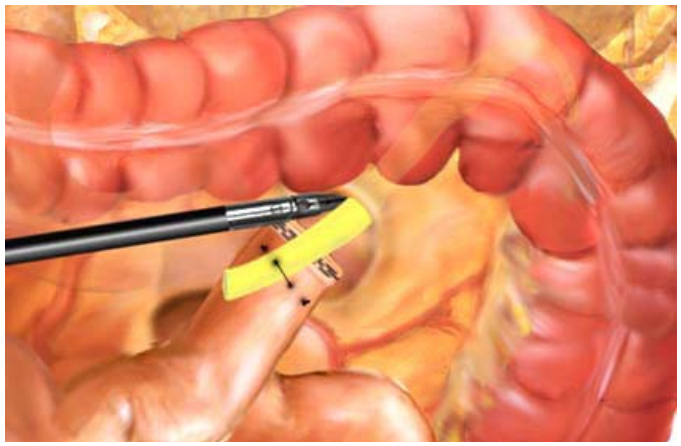
according to the patient BMI (Body Mass Index) and can range from 75 to 200 cm in length. Notice that the laparoscopic grasper is used as a rule



6.5.3.9: Using the rubber drain, the Roux-limb is pulled to a retrogastric position



6.5.3.7: Close up view of the entero-enterostomy



6.5.3.8: The Roux-limb is now advanced trough the mesocolic window

6.5.3.11: The enterotomy is stapled shut with another load of Endo GIA II. The anastomosis is secured by placing an extra row of stitches. The gastrojejunostomy and the enterotomy site are tested for leakage by applying insufflation through a nasogastric tube (or endoscope) and submerging the area in irrigation solution.

6.5.3.10: Following an enterotomy an anastomosis between the gastric pouch and the Roux-limb is created by firing an Endo GIA II

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COMPLICATIONS

Colored Atlas of the Laparoscopy

Chapter VII Complicaions

Laparoscopy inexperienced hand has no significant complications

7.1; INTRAOPERATIVE COMPLICATIONS

7.1.1; Cardiovasular

* . Hypotension

From decreased venous return, could be avoided by maintaining intraabdominal pressure during the procedure below 15mmHg

* .Arrhythmias ; occur in quarter to half of the patients, could be avoided by maintaining intraabdominal pressure during the procedure below 15mmHg

7.1.2: Pulmonary

* Hypoxemia

Occur in procedures need head down and extra insufflation of the peritoneum

* Hypercarbia

Due to ventilation-perfusion mismatch absorption of CO_2 , could be avoided by monitoring partial pressure of CO_2 in the blood and respiratory gas of the patient by capnogram

* Aspiration

Could be avoided by cuffed endotracheal tube

7.1.3: Biliary

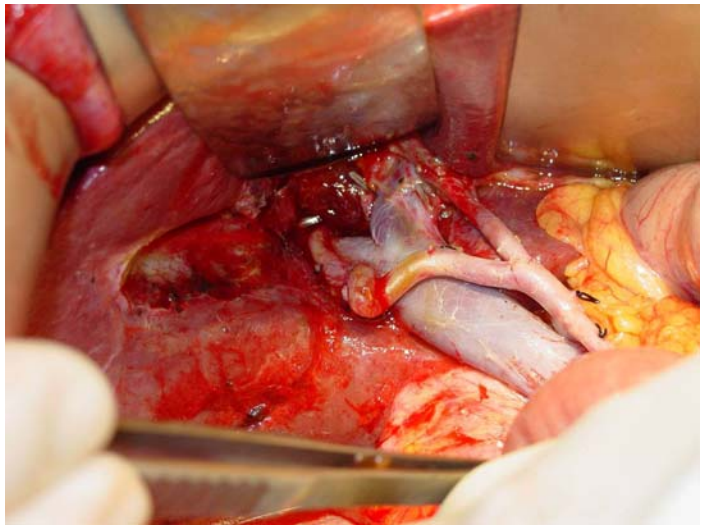
A study of misadventure data relating to laparoscopic surgery shows that the injury most frequently associated with the procedure is damage to the common bile duct, followed by perforation of the small bowel and perforation of

the colon. Injuries occur most often during gall bladder operations, with exploratory laparoscopy coming second. The data are contained in a report from the Physicians Insurers Association of America, which draws on information from 19 medical insurance companies, including the Medical Defence Union, under a data sharing project. Fifteen companies are from the United States and four are from Canada, the United Kingdom, and the Republic of Ireland.

Failure to identify the injury once it occurred was a key factor in the severity of the outcome. In over two thirds of the incidents examined, the injury was not identified until some time after the conclusion of the procedure. In some cases that delay led to serious complications, such as peritonitis and sepsis.

Cholecystectomy injuries were not recognised before the conclusion of the surgery in 83% of claims. Injuries that were recognised tended to be vascular in nature, whereas visceral injuries causing complications were more likely to remain unrecognised until after the end of surgery.

Difficulty in visualising the anatomical structures during laparoscopic surgery was a contributing factor to these types of adverse incident. Trocars



7.1: Repaired right hepatic duct

Classification of the biliary tract injuries, during. laparoscopic

Types A–E injuries are illustrated. Type E injuries are subdivided according to the Bismuth classification.21
Type A injuries originate from small bile ducts that are entered in the liver bed or from the cystic duct.
Types B and C injuries almost always involve aberrant right hepatic ducts.
Types A, C, D and some type E injuries may cause bilomas or fistulas.

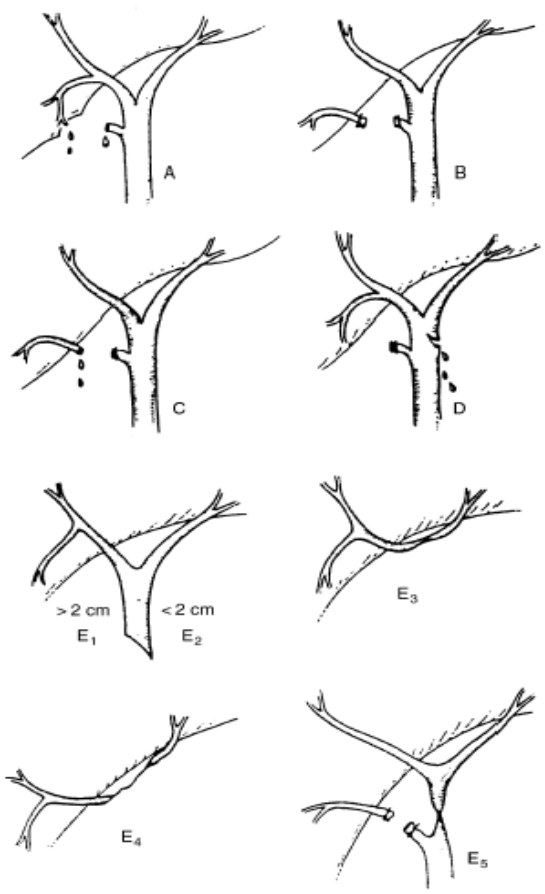
were the most common type of device causing injury.

Early reports indicated that the laparoscopic bile duct injury rate could be substantially higher than that seen with open cholecystectomy. Later reports, however, recorded improvements, most bile duct injury rates now being comparable to that expected with open cholecystectomy. Vascular and bowel injury can occur during placement of gas insufflation needles or access ports. Death or severe morbidity may result from the subsequent blood loss, gas embolism, or sepsis. The incidence of vascular and bowel injuries and gas embolisation can be minimised by techniques avoiding needle placement in the direction of major vascular structures and by the use of open port introduction techniques such as Hasson's cannula.

7.1.3.1: Common Bile Duct Injury

Ranges from 0.3-0.5%, the true incidence is probably higher . injury usually occurs during early experience of the operator ,risk of injury increases if the is difficulty in identifying the bile duct anatomy, and recognition of injury may be delayed

Type B and other type E injuries occlude the biliary tree and bilomas do not occur. (After Strasberg *et al.*,1 with permission.)



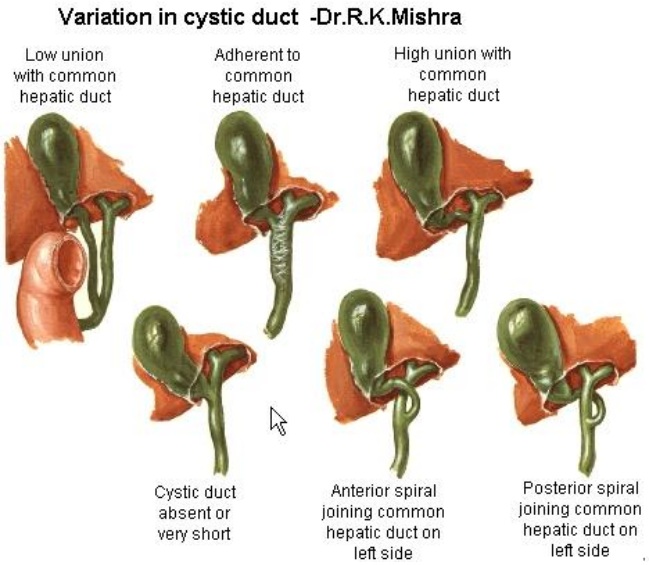
Incidence of Iatrogenic CBD injury is 0.12% and 0.55% during open and laparoscopic cholecystectomy respectively

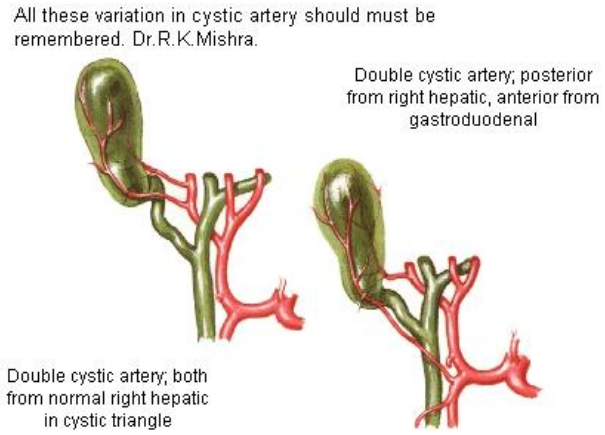
* Visual psychological studies has shown that laparoscopic surgeon works on snap interpretation by brain and success or disaster depends on whether snaps are right or wrong

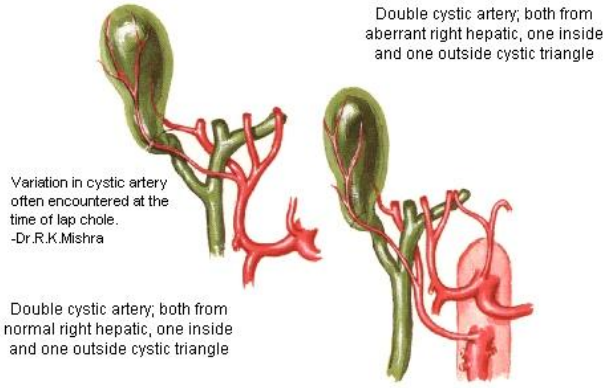
* Snap interpretation will be wrong if there is:

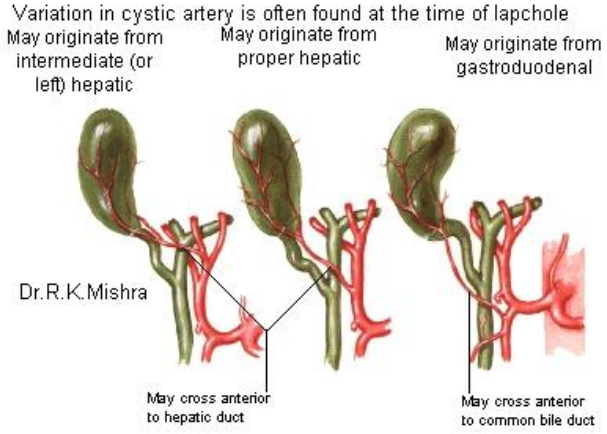
1. Eye ball degradation
2. Lack of Initial identification and memory of key structure to the point of absolute certainty.
3. Most important technical error is hilar bleeding and frantic attempts are made to control bleeding by electrosurgery.

To avoid injuries we must follow golden rules of cholecystectomy , one of these is exploration of Callots triangle before cutting any tissue > presence of normal variations in the artery or the duct will increase the chance of injury . In the following we try to show the most common types to be searched for:


Variation in cystic duct -Dr.R.K.Mishra
Low union with common hepatic duct
Adherent to common hepatic duct
High union with common hepatic duct
Cystic duct absent or very short
Anterior spiral joining common hepatic duct on left side
Posterior spiral joining common hepatic duct on left side


All these variation in cystic artery should must be remembered. Dr.R.K.Mishra.
Double cystic artery; posterior from right hepatic, anterior from gastroduodenal
Double cystic artery; both from normal right hepatic in cystic triangle


Double cystic artery; both from aberrant right hepatic, one inside and one outside cystic triangle
Variation in cystic artery often encountered at the time of lap chole.
-Dr.R.K.Mishra
Double cystic artery; both from normal right hepatic, one inside and one outside cystic triangle


Variation in cystic artery is often found at the time of lapchole
May originate from intermediate (or left) hepatic
May originate from proper hepatic
May originate from gastroduodenal
Dr.R.K.Mishra
May cross anterior to hepatic duct
May cross anterior to common bile duct

7.1.4: Others

* Subcutaneous Emphysema

Avoided by right insertion of Veress needle

* Bilateral eye hemorrhage

To our knowledge, this is the first case reporting a bilateral eye hemorrhage. This fact seems to confirm that the main cause involved is an increase in venous blood pressure due to carbon dioxide insufflation. The other causes such as hypercarbia (during peritoneal
resorption), sevoflurane (which reduces intraocular pressure known to increase the risk of intraocular Vascular rupture) are probably of a lesser importance. This postoperative complication is probably underestimated,
because only a macular obstruction is symptomatic. The recovery is frequently complete from a few days to a few months .

7.2: POST-OPERATIVE COMPLICATIONS

7.2.1: Port site hernia

There reported cases specially when the periumbilical port site overstretched in help of gallbladder extraction

7.1.3.2: Fall of gall stones

During difficult operations, the gallbladder may be inadvertently entered and stones spilled into the peritoneal cavity. Once gallbladder puncture has occurred and stones are lost then some are usually irretrievable, but it may be better to extract all the remaining stones into a bag before proceeding. In order to reduce the missing of stones. Stones left in the abdomen usually give no trouble.

Gallbladder perforation during laparoscopic cholecystectomy (LC) occurs in up to 40% of patients. Gallbladder perforation may result in spillage of bile and gallstones. If the spilled gallstones cannot be cleared from the peritoneal cavity, excessive effort to find and retrieve the stone or conversion to the open approach is not recommended because many clinical and experimental studies have shown minimal or no harm

Gallbladder perforation with spillage of bile and gallstones is to be expected in some patients during LC. Whenever possible all spilled gallstones should be retrieved.

However, if this is not possible, irrigation of the surgical area together with a short course of oral antibiotics seems to be effective in preventing potential complications.

The fascial defect of 10mm trocar not needs closure, on theoretical grounds alone we cannot see the closure of 1 cm defect

7.2.2: Ecchymoses of the abdominal wall

7.2.3: Wound infection

The incidence of surgical infections after laparoscopic cholecystectomy is reported to be <2%, because of the minimal trauma due to this approach.

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Colored Atlas of the Laparoscopy

Chapter VII Complicaions

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INDEX

Subject	Page number
adhesions	241,235–239, 193–194
anesthesia	141,142,151
antireflux surgery	278-287
Appendectomy, laparoscopic	245-257
Appendicitis, diagnostic laparoscopy	195,196
approach	288–294
Arrhythmia, diagnostic laparoscopy	143,150
Ascites, diagnostic laparoscopy	188
Bile duct injury, leak, laparoscopic	347–352
camera	34,35
cholangiography,	113,114
cholecystectomy	215–234,240–244
cholecystectomy, complications	245–250
clip applicators	97,98, 223,225
complication of peptic ulcer disease	191–193
complications	243–256,149,150
creating fundoplication	181
crural closure	281,283
diagnostic laparoscopy	183–212
electrocautery	41,89–96
endoscopic scissors	83–88
equipment	34
fundic mobilization	284
fundoplication	277–286
Future developments	125
Gallbladder	123,190,217,218,233
Gangrenous Appendix	196

Color Atlas of Laparoscopy

Index

INDEX

Subject	Page number
Graspers	68–78
Graspers, endoscopic	68-78
Groin hernia repair, laparoscopic	257–270
Groin, transabdominal preperitoneal	259
Hasson incision, diagnostic	175
Hernia	257–276
Hernioplasty, ventral/incisional,	271–276
Hiatal	281-286
historical perspective	1-30
wound infection	355
inguinal, totally extraperitoneal	67-69
instrumentation	45–46,166
insufflators	45
Irrigation devices	47,48
laparoscopic cholecystectomy	215,240
Laparoscopic hernioplasty	257
laparoscopic instruments	49
laparoscopic technique	161–176,213–306
learning curve	115-125
light source	36
mseh	265,275,276
mobilization of appendix	249-251
monitor	38-40
Nissen fundoplication	277–286
operating instruments	49
operating table	143
patient positioning	143,164,165
patient preparation	143,144,162,163

Color Atlas of Laparoscopy

Index

INDEX

Subject	Page number
pneumoperitoneum	166–170
preoperative evaluation	162,163,143,144
preperitoneal fascias, anatomy of	260
removing appendix	254,255
Ruptured corpus luteum cyst	199-200
staplers	111
surgical technique	213–306
telescope	37,38,174
trocar placement	170–174
trocar site hernia	354,355
trocars	55-57
using clips	233,234
video equipment	33-36